

Detachment Versus Compartmentalisation:
Priming and Intrusion Levels after Listening
to an Anxiety-Arousing Auditory Report

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Table of Contents

ABSTRACT	1
INTRODUCTION.....	2
POSTTRAUMATIC STRESS DISORDER.....	3
INTRUSIVE MEMORIES AND INFORMATION PROCESSING	4
PERITRAUMATIC DISSOCIATION	9
THEORETICAL SUBDIVISION OF DISSOCIATION	12
EXPERIMENTAL MANIPULATIONS OF DISSOCIATION	15
TRAUMA FILM PARADIGM (ANALOGUE TRAUMA)	17
CURRENT STUDY	20
AIMS AND HYPOTHESES.....	22
METHODS	24
PARTICIPANTS.....	24
MATERIALS.....	25
<i>Audio Clips</i>	<i>25</i>
<i>Visual Tasks.....</i>	<i>26</i>
MEASURES	28
<i>Demographic Questionnaire.....</i>	<i>28</i>
<i>Emotional Response Questions (ERQ)</i>	<i>28</i>
<i>Dissociation Tension Scale (DSS).....</i>	<i>29</i>
<i>State-Trait Anxiety Inventory (STAI).....</i>	<i>29</i>
<i>Modified Peritraumatic Dissociative Experiences Questionnaire (PDEQ).....</i>	<i>30</i>
<i>Post-Audio Measures of Commitment to Task.....</i>	<i>31</i>
<i>Follow Up Questions</i>	<i>32</i>
<i>Assessment of Perceptual and Conceptual Processing.....</i>	<i>32</i>
<i>Intrusion Diary.....</i>	<i>35</i>
PROCEDURE.....	36
<i>Main Experiment.....</i>	<i>36</i>
<i>Follow Up.....</i>	<i>39</i>
ANALYSIS	39
RESULTS	41
EXPERIMENTAL CONTROLS	41
<i>Age and Gender.....</i>	<i>41</i>
<i>Trait Anxiety and Dissociation.....</i>	<i>41</i>
<i>Post-Audio Questions.....</i>	<i>42</i>
<i>Diary Compliance.....</i>	<i>43</i>
<i>Controls of having Previously Seen the Movies.....</i>	<i>44</i>
MANIPULATION CHECK/ AUDIO IMPACT	44
<i>Emotional Response Questionnaires.....</i>	<i>45</i>
<i>State Anxiety</i>	<i>46</i>
MANIPULATION OF TWO DISTINCT FORMS OF DISSOCIATION.....	48
CONCEPTUAL AND PERCEPTUAL PRIMING	54
<i>Word-Cue Task.....</i>	<i>54</i>
<i>White-Noise Task.....</i>	<i>56</i>
DIARY.....	58
<i>Number of Intrusions</i>	<i>59</i>
<i>Severity of Intrusions.....</i>	<i>60</i>
DISCUSSION	62
<i>Aim One: Assessment of audio-only trauma paradigm</i>	<i>64</i>

<i>Aim Two/Hypothesis One: Differentiating two types of dissociation</i>	<i>66</i>
<i>Aim Three/Hypothesis Two: Cognitive processing.....</i>	<i>70</i>
<i>Hypothesis Three: Intrusions.....</i>	<i>72</i>
METHODOLOGICAL LIMITATIONS AND STRENGTHS	75
SUMMARY.....	79
REFERENCES.....	81
APPENDICES	90
APPENDIX A: HUMAN ETHICS APPROVAL	90
APPENDIX B: DEMOGRAPHIC QUESTIONNAIRE	91
APPENDIX C: EMOTIONAL RESPONSE QUESTIONNAIRE (ERQ).....	92
APPENDIX D: DISSOCIATION TENSION SCALE (DSS).....	93
APPENDIX E: STATE ANXIETY INVENTORY (STAI-S).....	94
APPENDIX F: TRAIT ANXIETY INVENTORY (STAI-T).....	95
APPENDIX G: MODIFIED PERITRAUMATIC DISSOCIATIVE EXPERIENCES QUESTIONNAIRE (PDEQ)	96
APPENDIX H: POST AUDIO MEASURES OF COMMITMENT TO TASK	96
APPENDIX I: FOLLOW-UP QUESTIONS	98
APPENDIX J: WORD LISTS FOR WORD-CUE ASSOCIATION TASK.....	99
APPENDIX K: WORD LISTS FOR WHITE-NOISE TASK.....	100
APPENDIX L: INTRUSION DIARY.....	101
APPENDIX M: INFORMATION FORM	102
APPENDIX N: CONSENT FORM.....	104
APPENDIX O: DEBRIEF FORM	105
APPENDIX P: INTRODUCTION TO AUDIO TEXT	107
APPENDIX Q: WHITE NOISE TASK SCORES FOR NEUTRAL WORDS	108

LIST OF TABLES

TABLE 1: DEMOGRAPHIC INFORMATION FOR EACH OF THE THREE CONDITIONS AND FOR THE OVERALL TOTAL	41
TABLE 2: STAI-S SCORES FOR EACH OF THE THREE CONDITIONS AND FOR THE COMBINED TOTAL	42
TABLE 3: DSS SCORES FOR EACH OF THE THREE CONDITIONS AND FOR THE COMBINED TOTAL	42
TABLE 4: OVERALL RATINGS FOR VISUAL AND AUDIO ATTENTION AND REPORTED DISTRESS LEVELS OF THE THREAT AND NEUTRAL AUDIO CLIPS	43
TABLE 5: DIARY COMPLIANCE FOR EACH OF THE THREE CONDITIONS AND FOR THE COMBINED TOTAL	44
TABLE 6: PRE- AND POST-AUDIO ERQ SCORES FOR LEVELS OF HAPPINESS, DEPRESSIVENESS AND ANGER	46
TABLE 7: PRE-AUDIO STAI-S SCORES FOR EACH OF THE THREE CONDITIONS AND FOR THE COMBINED TOTAL	48
TABLE 8: POST-AUDIO STAI-S SCORES FOR EACH OF THE THREE CONDITIONS AND FOR THE COMBINED TOTAL	48
TABLE 9: PDEQ SCORES FOR EACH OF THE THREE CONDITIONS AND THE COMBINED TOTAL	50
TABLE 10: MEANS (AND SD) FOR THE SPINNING-DOT AND MIRROR CONDITIONS ACROSS PDEQ CATEGORY	50
TABLE 11: VARIMAX ROTATED PDEQ ITEM LOADINGS ACROSS TWO FACTORS	52
TABLE 12: MEANS (AND SD) FOR THE SPINNING-DOT AND MIRROR CONDITIONS ACROSS THE FACTOR ANALYSIS PROPOSED COMPONENTS	52
TABLE 13: MEANS (AND SD) FOR THE SPINNING-DOT AND MIRROR CONDITIONS ACROSS THE COMBINED DIFFERENTIATION COMPONENTS	54
TABLE 14: WORD-CUE SCORES FOR THE NEUTRAL AND THREAT WORD CATEGORIES AND THE COMBINED TOTAL	55
TABLE 15: WORD-CUE SCORES FOR EACH OF THE THREE CONDITIONS	56
TABLE 16: TOTAL WHITE-NOISE SCORES FOR EACH OF THE THREE CONDITIONS AND THE COMBINED TOTAL	57
TABLE 17: THREAT-WORD ONLY WHITE-NOISE SCORES FOR EACH OF THE THREE CONDITIONS AND THE COMBINED TOTAL	58
TABLE 18: OVERALL TOTAL NUMBER OF INTRUSIONS BY DAY AND IN TOTAL (ALL PARTICIPANTS)	59
TABLE 19: OVERALL TOTAL NUMBER OF INTRUSIONS BY DAY AND IN TOTAL, EXCLUDING THOSE WHO EXPERIENCED NO INTRUSIONS	60
TABLE 20: SEVERITY OF INTRUSIONS BY DAY AND COMBINED MEAN OF ALL DAYS	61
TABLE 21: COMBINED SEVERITY OF INTRUSIONS ACROSS THE THREE CONDITIONS	61

List of Figures

FIGURE 1: BASIC PROCEDURE OF THE TRAUMA FILM PARADIGM (TAKEN FROM HOLMES & BOURNE, 2008)..... 19

FIGURE 2: EXAMPLES OF THE NEUTRAL IMAGES PRESENTED DURING THE AUDIO TASK.....26

FIGURE 3: A STATIONARY REPRESENTATION OF THE SPINNING-DOT VISUAL PRESENTATION27

FIGURE 4: MEAN STAI-S SCORES AT PRE-AUDIO AND POST-AUDIO, BY CONDITION47

Abstract

During traumatic events, individuals can experience dissociative symptoms related to changes in cognitive processing; these changes are suggested to impact on the development of posttraumatic stress disorder (PTSD) symptoms. Past literature has proposed two forms of peritraumatic dissociation (compartmentalisation and detachment), however little quantitative research has focussed on separately manipulating these experiences in order to further our understanding of their aetiology. The current study addressed this knowledge gap and additionally sought to understand the role of cognitive processing in the dissociation-intrusion relationship. Using an audio-only adaption of the trauma film paradigm, 60 participants were divided into three conditions and presented with different visual tasks - mirror staring, dot-staring or neutral images – that were hypothesised to induce the two forms of dissociation. Post-audio, a number of factors were assessed, including state dissociation, perceptual priming and conceptual priming, as well as intrusions over the following days. As hypothesised, participants in the dissociation conditions displayed an increase in perceptual priming compared the control conditions, and reported more severe intrusions. However, no differences were found in conceptual priming, in the overall number of intrusions between conditions, or in dissociative symptoms between the dissociation conditions. The current study utilised new techniques in the analysis of PTSD and its origins, and showed their potential in the experimental study of dissociation and analogue trauma techniques. The findings also contributed to the growing body of knowledge investigating the impact that dissociation and cognitive processing has on the aetiology of PTSD.

Introduction

The present study seeks to further the understanding of the role of information processing and dissociation in the development of Posttraumatic Stress Disorder (PTSD) symptoms after experiencing a traumatic event. The literature suggests that specific types of processing during a traumatic event may lead to later posttraumatic intrusions (Holmes, Brewin & Hennessy, 2004; Kindt, Van den Hout, Arntz & Drost, 2008). This thesis was designed to further assess the proposition that intrusions can arise from dysfunctional information processing at encoding and retrieval in those who have been exposed to analogue trauma. Dissociation has been tentatively associated with information processing anomalies (Ehlers & Clark, 2000; Brewin, 2001; Lyttle, Dorahy, Hanna & Huntjens, 2010). Current literature proposes two distinct forms of dissociation (detachment and compartmentalisation). This study aims to address whether the two types can be separated and differentially manipulated experimentally to produce intrusions via specific information processing disruptions.

The first section of this introduction begins by defining Posttraumatic Stress Disorder (PTSD), followed by a discussion of one of the hallmark symptoms of PTSD – intrusions - and their proposed theoretical causes. Particular emphasis is given to perceptual and conceptual processing of experiences. Next, peritraumatic dissociation is introduced, and the proposed dichotomy between dissociation as detachment and compartmentalisation is explored. This is followed by an overview of some of the methodologies utilised to study PTSD experimentally, including the analogue Trauma Film Paradigm as well as the auditory adaption of this paradigm used in the current research. Finally, the aims and hypotheses of the current study are presented.

Posttraumatic Stress Disorder

PTSD is a psychiatric disorder that can develop in response to actual or threatened death, serious injury, or sexual violation, as described in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-V; American Psychiatric Association, 2013). The DSM-V recognises a wide variety of symptoms associated with PTSD, and presents them in the following groups: re-experiencing phenomena, avoidance behaviours, responsiveness numbing, increased arousal, and negative thoughts, feelings or moods (APA, 2013). Some studies have shown that as many as 68% of adults have experienced at least one severe traumatic event during their lifetime (Bernat, Ronfeldt, Calhoun & Arias, 1998). Traumatic events can include war and civil unrest, natural disasters, torture, transport accidents and interpersonal crimes such as sexual and physical assaults (Bernat et al., 1998). Although it is common for exposure to trauma to induce re-experiencing, heightened arousal, avoidance behaviours and negative thoughts and feelings (APA, 2013), these symptoms often subside over time. However, some individuals continue to experience symptoms beyond one month of the trauma and therefore go on to develop PTSD. Studies have suggested that the lifetime prevalence of PTSD in the United States is as high as 6.8% (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Breslau, 2001). Due to its prevalence in the general population, PTSD has become an important research area within psychology (Breslau, 2001).

While there is still some disagreement over the exact psychological processes involved in the aetiology of PTSD, a widely supported explanation from cognitive science is that the development of the disorder is due to dysfunctional processing of the traumatic event, which interferes with one's

ability to fully integrate cognitive representations of the experience into general autobiographical memory (Buck, Kindt & Van den Hout, 2009; Ehlers & Clark, 2000; Brewin & Holmes, 2003). The precursor to the symptoms experienced by those suffering from PTSD is thought to be faulty information-processing, caused by dysfunctional memory encoding and maintenance (Ehlers & Clark, 2000; Brewin & Holmes, 2003). One of the most prevalent and debilitating symptoms of PTSD is the intrusive re-experiencing of traumatic memories in the form of 'intrusions' and 'flashbacks' (Holmes, Brewin & Hennessy, 2004).

Intrusive Memories and Information Processing

Flashbacks, intrusions and re-experiences of the traumatic event are a key diagnostic symptom of PTSD, encapsulating one of the three main symptom categories required for diagnosis (APA, 2013). Intrusive re-experiencing of memories pertaining to the event - including images, thoughts and perceptions - are generally involuntary, spontaneous, repetitive and difficult to control; they are also generally vivid in nature (Ehlers, Hackmann & Michaels, 2004; Brewin Gregory, Lipton & Burgess, 2010). Intrusions are accompanied by strong adverse emotions that can disrupt individuals' everyday life (Ehlers, et al. 2004). Intrusions are memories, or personal experiences that arise spontaneously, without any attempt of withdrawal. What defines flashbacks from other forms of intrusions is that individuals relive the experience as though it were happening at present, and can lose all awareness of their present surroundings. The emotional response to the flashbacks is often as strong as emotions were at the time of the original traumatic event (Ehlers, Hackmann & Michaels, 2004) and

can be triggered even when the individual's current situation bears no resemblance to the traumatic situation (Ball & Little, 2006). These intrusions and flashbacks can be experienced in visual, auditory, and olfactory modalities, as well as in verbal thoughts, and are generally segments of the event, rather than the event in its entirety (Holmes & Bourne, 2008). As with the development of PTSD in general, dysfunctional processing of the traumatic event is thought to be the cause of these very vivid and uncontrollable re-experiences and flashbacks (Ehlers & Clark, 2000; Brewin & Holmes, 2003).

It has been theorised that during a trauma, one's cognitive processing focus changes from a conceptual processing to a more perceptual processing style. Perceptual processing is defined as the encoding of data-driven (perceptual) information such as perceptions (e.g. sights and smells), emotions (e.g. fear) and feelings (e.g. pain), whereas conceptual processing is the processing of overall meaning of the situation, including organising what occurred and giving it contextual meaning (Huntjens, Dorahy & Wees, 2013). Two separate, but similar, models have been proposed to explain this phenomenon: Ehlers and Clarke's Cognitive Model (Ehlers & Clark, 2000), and Brewin's Dual-Representation Theory (Brewin, 2001; Brewin, Dalgleish & Joseph, 1996; Brewin, Gregory, Lipton & Burgess, 2010).

The Cognitive Model of PTSD (Ehlers & Clark, 2000) posits that information processing during a traumatic event is more centred on perceptual information (such as colours, smells and noises), leading to stronger memory of perceptual information. This leads to strong associations between cued (e.g. a loud noise) and original (e.g. a gunshot) stimuli, and between the stimuli and a strong affective response (e.g. intense fear). As a result of the strong perceptual

associations, the stimuli encoded at the time of the trauma has a greater chance of having unintentional, cue-driven retrieval of memories and affect (e.g., having feelings of intense fear after any loud noise) (Kleim, Ehring, & Ehlers, 2011; Sündermann, Hauschildt, & Ehlers, 2013). Conceptual processing, however, is thought to influence intrusions in the opposite way, with a greater integration of the overall meaning or narrative of a traumatic event into autobiographical memory. This leads to an impeded cue-driven response, and aids in the intentional recall of the event (Kleim et al., 2011; Sündermann et al., 2013).

The Dual-Representation Theory was proposed by Brewin and colleagues (1996), and postulates that memories of traumatic events are processed by two distinct memory systems: Verbally Accessible Memory (VAM) and Situationally Accessible Memory (SAM). In the VAM, narratives of the trauma are stored with autobiographical memories and are available for intentional retrieval. This memory system deals with the more elaborate or conceptual parts of the trauma. The SAM, however, deals with the more perceptual stimuli of the traumatic event. In this system, information is stored in a more shallow way, allowing memories to be triggered as involuntary flashbacks or intrusions, but inhibiting intentional recall or communication to others. The Dual-Representation Theory also states that during a traumatic event, the SAM system is more active, which can inhibit the VAM system making well-integrated representations of the event.

What both of these models agree on is that conceptual processing consists of focusing on the meaning and context of the event (Ehlers & Clark, 2000), and/or the conscious verbal processing of the situation (Brewin & Holmes, 2003). Perceptual processing, however, concentrates much more on sensory processing and storage of one's experiences (Brewin & Holmes, 2003; Ehlers &

Clark, 2000). This heightened perceptual and reduced conceptual processing during the traumatic event is supported by the finding that people who have experienced trauma often have poor intentional recall of specific, detailed memories of the event, yet intrusions are usually very vivid and detailed (Kindt, Van den Hout, Arntz & Drost, 2008). Many studies have also found that perceptual and conceptual processing are inversely related, whereby perceptual processing of information increases as conceptual processing decreases, thus increasing cue-driven retrieval (Lyttle, Dorahy, Hanna & Huntjens, 2010; Buck, Kindt & Van den Hout, 2009; Kindt et al., 2008).

During perceptual processing of events, sensory information is not assimilated into autobiographical memory adequately, leading to a lack of temporal awareness and poor intentional recall ability. However, due to the often rapid and life-threatening nature of traumatic events, the change in peritraumatic processing may actually have short-term advantages. An increase in sensory and visuospatial processing may lead to an increased chance of noticing ways to escape the situation, and may also provide important information in learning how to avoid similar situations in the future (Holmes & Bourne, 2008).

Lyttle and colleagues (2010) used a population exposed to traumatic events in Northern Ireland, and compared information processing in those with and without PTSD. Participants were exposed to words associated with the Northern Irish political conflict as well as general threat and neutral words. A word-cue association task was used to assess levels of conceptual priming and a word-stem completion task was used to assess perceptual priming. The word-stem completion task is an implicit memory paradigm, measuring priming for

previously encoded words using the first letters (stems) as perceptual retrieval cues. Lyttle and colleagues (2010) used a revised version of the task, which gave alternative, more common responses to words (e.g. for-mal) in order to act as direct competition to the threat word (e.g. for-ced), therefore if an individual completed the stem 'for__' with the word 'forced' rather than the more common 'formal', perceptual priming could be assumed. The word-cue task is a widely used implicit memory paradigm used to measure conceptual priming, and uses cue-words associated with previously encoded target words as a semantic retrieval cue. If an individual retrieves the previously encoded target word (target) over more commonly associated words, conceptual priming is implied. The PTSD sample showed greater levels of conflict-related perceptual priming on a word stem completion task than those without PTSD. They also found that those with PTSD showed lower levels of conceptual priming in a word-cue association task for conflict-related words, compared with the non-PTSD group (Lyttle, Dorahy, Hanna & Huntjens, 2010). These findings support the idea that reduced levels of conceptual processing during a traumatic event (and increased levels of perceptual processing) can lead to an increased risk of developing PTSD.

This theory has also been supported by neurological studies, which have found that while individuals are in a relaxed state, contextual information is integrated and consolidated into memory by our hippocampus (Brown, 2002). The hippocampus is crucial in our development and consolidation of episodic or autobiographical memories (Feinberg & Farah, 2003); these types of memories are most associated with conceptual style processing. In contrast, during a traumatic event, the more responsive amygdala assumes responsibility, leading

to faster but less organised integration, which can be most associated with perceptual style processing (Brown, 2002). The amygdala is responsible for the integration of memories of emotional events, with fear conditioning often arising from the associations made between heightened perceptions (e.g smell and hearing) and memory. In addition, information processed by the amygdala was found to lack spacial and temporal context (Feinberg & Farah, 2003). It is thought that this neurological change could be one explanation for the change in processing style during a traumatic event (Brown, 2002).

Although it is widely accepted that dysfunctional processing is one of the contributing factors leading to PTSD, less is known about what exactly causes the dysfunction during, and following, a traumatic event (Brewin & Holmes, 2003). One theory about the aetiology of the information processing dysfunction at the time of the trauma is referred to as peritraumatic dissociation.

Peritraumatic Dissociation

Dissociation is a commonly experienced psychological phenomenon, characterised by alterations in one's sense of self and the world around them. The DSM-V identifies five separate components of dissociation: identity alteration, identity confusion, amnesia, depersonalisation and derealisation (APA, 2013). Identity alteration is the process of acting or feeling like a different person. Identity confusion is viewed as an inner struggle over one's sense of identity. Amnesia is the inability or difficulty in recalling personal information or memories. Depersonalisation is seen as the feeling of separation and estrangement from one's self or as if living in a dream. Finally, derealisation is

seen as alterations in the sense of reality and the perception of one's surroundings (Steinberg & Schnall, 2001; APA, 2013). Dissociation causes disruptions of normal integrated consciousness or psychological functioning (Brewin & Holmes, 2003). Peritraumatic dissociation relates to dissociative episodes occurring around the time of a traumatic event, which typically produce disruptions in memory processing, consciousness and cognitions for the event and personal identity (Marmar et al., 1994; Holmes et al., 2005).

In a meta-analytic study, Ozer and colleagues (2003) found that peritraumatic dissociation was the strongest predictor of PTSD (weighted $r = .35$) out of a number of hypothesised factors (Ozer, Best, Lipsey, & Weiss, 2003). A vast amount of literature supports this finding, in both factorial (often retrospective) and experimental studies, involving both clinical and non-clinical populations, and across a wide variety of situations and trauma types (Brewin & Holmes, 2003; Ehlers & Clark, 2000; Holmes & Bourne, 2008; Ehling, Ehlers & Glucksman, 2008; Shalev, Peri, Canetti & Schreiber, 1996; Breh & Seidler, 2007). Due to its apparent role in the development of PTSD symptomatology, many researchers are starting to look more closely at dissociation and its arguably over-generalised definition (Holmes et al., 2005).

Alterations in consciousness and dissociation

One's state of consciousness changes constantly (usually involuntarily) and is influenced by a multitude of factors, such as the difficulty of a performed task, or the number of concurrent tasks. These changes can occur from alterations in either the field of consciousness (wide/narrow) and/or the level of consciousness (low/high), and are generally seen as adaptive responses (Van der Hart, Nijenhuis & Steele, 2006). Field of consciousness can be influenced by our

external environment and our internal state; in some situations it is more adaptive to focus narrowly on a particular task, whereas in others, it is much more beneficial to be aware of a broad range of stimuli. Similarly, changes in the level of consciousness can be adaptive, allowing one to use more cognitive resources when they are needed (such as driving a car), or to conserve resources when they are not needed (such as resting) (Zoellner & Bittenger, 2004).

Although changes in consciousness can be a normal response to a traumatic event, they may also interfere with the encoding of traumatic information (Steele et al., 2009). During traumatic events, an individual's field of consciousness often narrows, and their level of consciousness increases; this is displayed in eyewitness reports of traumatic events, such as armed robberies, where the witness becomes so fixated on the weapon that they cannot later describe the assailant (Allen et al., 2009). These changes in consciousness or focus can lead to reduced levels of conceptual processing, and increased perceptual processing of specific stimuli (Zoellner & Bittenger, 2004), because the person directs considerable portions of attention to perceptual information (e.g., the weapon).

Dissociation is a very complex psychobiological construct (See Dell, 2009). Some theorists propose that alterations in the field and level of consciousness reflect dissociation (Dalenberg & Paulson, 2009), while other theorists believe such experiences reflect the vagaries of consciousness but not dissociation per se (e.g., Steele et al., 2009; Van der Hart, Nijenhuis & Steele, 2009). Rather, they argue dissociation should be limited to a breakdowns in integrated functioning at the level of the personality, where experiences become compartmentalised and form different aspects or subsystems within the

personality (Van der Hart et al., 2006). This is referred to as structural dissociation.

Theoretical Subdivision of Dissociation

The term 'dissociation' has been hypothesised to encompass two distinct, but closely related phenomena (Brown, 2002; Brown 2006; Cardena, 1994; Holmes et al., 2005; Putnam, 1997; Steele, Dorahy, Van der Hart, & Nijenhuis, 2009). Allen (2001) proposed that dissociation can be understood in terms of 'detachment' and 'compartmentalisation'. Steele and colleagues (2009) also suggest a similar division, into what they term 'alterations in consciousness' and 'structural dissociation'. Although labelled differently, both these models share some theoretical similarities; 'detachment' or 'alterations in consciousness' is characterised by changes in ones' consciousness (e.g., field, level), whereas 'compartmentalisation' or 'structural dissociation' are characterised by structural separations in personality (Holmes et al., 2005; Steele et al., 2009). Allen (2001) describes detachment as the most pervasive form of dissociative disturbance, comprising both depersonalisation and derealisation. Compartmentalisation is typically manifest in more dramatic but less common dissociative phenomena, where one dissociative aspect of the personality impacts by omission (e.g., amnesia, fugue) or commission (e.g., flashbacks) on another. Although there are slight differences in the theories presented by Allen (2001), Holmes et al. (2005), and Steele and colleagues (2009), the current study acknowledges these positions contain more similarities than differences, and thus combine them into one over-arching theory of dissociation; the terminology

used by Allen (2001) is adopted in the current study for ease of use. Detachment and compartmentalisation are now defined and explored.

Detachment: Detachment is defined as the experiences of altered states of consciousness, characterised by separation, or detachment, from ones-self or the external world. This is most commonly reported as feelings of depersonalisation, derealisation and out-of-body experiences (Holmes et al., 2005). There is also often a numbing or absence of emotion during detachment, which is commonly reported in victims after serious physical and sexual assault (Horowitz, 1997). Descriptions of detachment during trauma often include feelings of being 'spaced out' or that the situation feels 'unreal, as if in a dream'. The emotional numbing is apparent in statements such as 'not feeling as though things were actually happening' and 'feelings of lifelessness' (Sierra & Berrios, 1998). Other experiences of detachment include feelings of time changing and general disorientation and confusion (Steele et al., 2009).

The alterations in consciousness during detachment-type peritraumatic dissociation can interfere with encoding and consolidation of information or stimuli, producing inadequate representations of the traumatic event in autobiographical memory (Holmes, Brewin, & Hennessey, 2004). This disruption to normal functioning of memory formation is thought to be a crucial component in the later development of intrusions and flashbacks so commonly seen in PTSD (Ehlers & Clarke, 2000; Brewin & Holmes, 2003; Spitzer, Barnow, Freyberger & Grabe, 2006).

Compartmentalisation: Compartmentalisation involves structural separations (divisions) in personality, as well as the inability to control processes or actions that are normally subject to control, such as bringing

usually accessible information into conscious awareness (Spitzer et al., 2006). Examples of compartmentalisation symptoms during trauma include the phenomena of dissociative amnesia, conversion symptoms and other neurological experiences (Steele et al., 2009; Holmes et al., 2005; Allen et al., 1999). Holmes and colleagues (2005) also include ego-observing in their definition. Here symptoms are produced from information being stored in compartments. Compartmentalisation can cause changes in an individual's conscious state, consequently causing difficulties in retrieving a memory, as it was formed in a very different state of consciousness than that normally experienced (Steele et al., 2009; Holmes et al., 2005). After experiencing a traumatic event, compartmentalisation-type dissociation can lead to structural separation of the memory between states; although the memory may exist, it may not be accessible because the individual did not process the whole experience in one aspect of self, such that the information or some of it resides in a different diversion of the personality or compartment (Van der Hart et al., 2006). This may lead to a dysfunction of memory during the retrieval phase.

One key aspect of 'compartmentalised' memories is that they are still encoded adequately into memory formation, and can still influence emotion, cognition and behaviour, even though they cannot be explicitly recalled (Holmes et al., 2005). In addition, compartmentalisation is not characterised by disengagement from the environment and aspects of oneself, as is the case in detachment (Steele et al., 2009). In other words, amnesia due to detachment is thought to be due to problems with encoding that may have the information stored in more perceptual forms, making narrative retrieval difficult. In compartmentalisation, however, the information may be encoded more fully

during the trauma, but the individual lacks the ability to intentionally recall it because it is stored in a different 'compartment' of consciousness (Steele, et al., 2009; Holmes et al, 2005).

Interest in the theoretical split of dissociation into compartmentalisation-type and detachment-type is beginning to increase. Recent developments of a number of methodologies to assess information processing during trauma and analogue trauma may help quantify the theory experimentally. These methodologies are discussed below.

Experimental Manipulations of Dissociation

Studies have shown that detachment can be induced through a number of experimental techniques, including hyperventilation, hypnosis, strobe lights and dot-staring tasks (Lickel, Nelson, Lickel & Deacon, 2008; Holmes, Oakley, Stuart & Brewin, 2006). The most common of these methods is the 'dot-staring' task (Leonard, Telch & Harrington, 1999; Miller, Brown, DiNardo & Barlow, 1994). During these experiments, individuals stare at a black dot for between three and ten minutes, eliciting significantly detachment experiences, including both depersonalisation and derealisation symptoms (Leonard et al, 1999; Miller et al., 1994). Extending the simple dot-staring task, Lickel and colleagues (2008) found that the addition of a spiral to the dot significantly increased symptoms of depersonalisation and derealisation compared to the dot on its own.

In contrast to detachment, experimental manipulations of compartmentalisation have been explored to a much lesser degree (Holmes et al, 2005). Compartmentalisation-type dissociative experiences are generally more

'extreme' and therefore more difficult to induce in the laboratory. However, one method that has been used successfully in previous literature is hypnosis (Hagenaars, Van Minnen, Holmes, Brewin & Hoogduin, 2008; Holmes et al, 2006; Stuart, Holmes & Brewin, 2006). Hypnosis allows the creation of otherwise difficult to manipulate compartmentalisation-type phenomena, such as ego-observing and alterations to one's sense of self as a unified entity. In a study by Hagenaars and colleagues (2008), individuals that had hypnotically-induced catalepsy were found to be more perceptually primed to information presented during a traumatic film than those in the control group. The catalepsy group also experienced more intrusions in the days following the film than the control group, suggesting that compartmentalisation-type dissociation can be manipulated. Another study increased state dissociation by asking participants to watch a traumatic film as if they were watching over their own shoulder (i.e. third-person view; Zoellner, Sacks, & Foa, 2007). Individuals who were required to watch the trauma film through third-person view reported significantly higher state dissociation than the control group (Zoellner et al., 2007).

A more recent study has shown that a simple mirror-staring task can also induce ego-observing experiences. Caputo (2010) conducted an experiment where individuals were placed in front of a mirror and instructed to observe their own face - focusing on their eyes - for an extended amount of time, and were then asked to report what they experienced. Most individuals reported major distortions in the perception of their face, as well as apparitional experiences (i.e., detachment). It also induced compartmentalisation episodes such as 'out-of-body' or 'top-down' experiences, as well as autoscopic

hallucinations often reported during peri-traumatic ego-observing symptoms (Spitzer et al, 2006; Brugger, 2002).

Although there has been a moderate amount of research on the effects of peri-traumatic dissociation in intrusion development, the results have been varied (Holmes & Bourne, 2008; Leonard et al., 1999; Zoellner et al., 2007). One possible explanation for this could be that the majority of such research only used one simple peri-traumatic dissociation-inducing method at a time, such as the dot staring task (Holmes & Bourne, 2008). In doing this, the researchers are not creating a full range of dissociative experiences, but are instead inducing only one type of dissociation (e.g. detachment-type for the dot-staring task). Although many studies have acknowledged the possibility of two distinct forms of dissociation, very few have tried experimentally separating the two. The current study aims to address this gap in the literature by inducing and measuring the two proposed forms of dissociation using an adapted version of the trauma film paradigm.

Trauma Film Paradigm (Analogue Trauma)

Much of the experimental research on dissociation and PTSD has been conducted using the trauma film paradigm (Holmes & Bourne, 2008). This paradigm is primarily used on non-clinical populations, and involves showing short films containing stressful and traumatic scenes in order to mimic the experience of a traumatic event. The (analogue) trauma film paradigm has been shown to successfully elicit intrusions similar to those found in clinical populations (Holmes & Bourne, 2008). This experimental methodology not only

allows for the control of the 'traumatic' stimulus and situational factors, but also allows for the experimental manipulation and measurement of memory encoding, maintenance and retrieval (Holmes & Bourne, 2008).

Holmes and Bourne (2008) conducted a review of the trauma film paradigm and found that it was a very effective prospective tool, capable of inducing intrusions and analogue trauma-related symptoms. Not only has it been shown to successfully induce intrusions, but Holmes and Bourne also concluded that it has allowed the successful manipulation of peri-traumatic variables, such as dissociation and information processing.

Experiments using the trauma film paradigm generally follow the following procedure: participants first undergo initial pre-film measures (including trait measures, baselines of state measures, and demographics), and then view a short film depicting some variety of traumatic event. Films used in past studies have included actual footage of road traffic accidents, and eyewitness reports of trauma (Holmes & Bourne, 2008; Holmes, Brewin & Hennessy, 2004). Other studies have used extracts from films, such as *Salo, or the 120 days of Sodom* (which contain scenes of sexual and physical abuse, and torture), to induce stress (Buck, Kindt & Van den Hout, 2009; Kindt, Van den Hout & Buck, 2005; Kindt & Van den Hout, 2003). During the film, participants are often asked to perform a concurrent task (usually the experimental manipulation), such as counting backwards or doing a response task (Holmes & Bourne, 2008; Holmes, Oakley, Stuart, & Brewin, 2006). Some studies use techniques for inducing dissociative experiences during the film, such as hypnosis (Hagenaars et al., 2008; Holmes et al., 2006; Stuart et al., 2006), hyperventilation (Lickel et al., 2008) or a visual task including dot-staring tasks

and third person perspectives (Zoellner et al., 2007; Leonard et al., 1999; Miller et al., 1994). After the film, additional measures are taken, including a follow-up of state measures and manipulation checks. Participants are then instructed to use an intrusion diary to record any intrusions experienced over the following days. A set number of days later, participants return the diary and undergo any additional follow-up measures (Holmes & Bourne, 2008). A visual representation of the trauma film paradigm procedure is shown in Figure 1.



Figure 1. Basic procedure of the trauma film paradigm (taken from Holmes & Bourne, 2008).

Most analogue PTSD studies have focused on presenting the trauma via audio and visual means (the trauma film paradigm). Although these studies have been robust in producing analogue PTSD symptoms, they limit the ability to experimentally manipulate and induce dissociation because they absorb both auditory and visual senses. A study by Krans and colleagues (2010) used a slightly different design to assess if intrusive visual images could develop from listening to a traumatic event (i.e. no visual stimuli). Not only did they show that traumatic symptoms could arise from simply listening to a traumatic event, but they also showed that individuals developed vivid, intrusive visual images as a result of the audio (Krans, Naring, Holmes & Becker, 2010). This paradigm provides a means for greater experimental manipulation during exposure to the

traumatic stimuli, because the distress stimuli induce analogue PTSD symptoms through one sensory channel. This allows greater flexibility in the experimental manipulation of peri-traumatic dissociation via visual modalities.

Current Study

The present study sought to further the understanding of dissociation in the development of PTSD, by experimentally separating and inducing the two proposed forms of dissociation (compartmentalisation and detachment) and measuring subsequent intrusions. As with Krans and colleagues (2010), the analogue traumatic stimulus was presented in an auditory format; this allowed for the visual manipulation of peritraumatic dissociation. Three groups were exposed to the same auditory stimuli, however the visual tasks presented to each group differed in order to produce different types of dissociation. The first group acted as a control group, and was presented with neutral pictures throughout the experiment. The second group was presented with a spinning-dot, which has previously been shown to induce detachment (Lickel et al, 2008). The third group was required to observe themselves in a mirror during the audio clips, which has previously been shown to produce compartmentalisation-type phenomena (Brugger, 2002; Caputo, 2010; Spitzer et al, 2006). These experimental manipulations enabled further investigation into whether it is possible to experimentally separate the different forms of dissociation through the use of specific visual tasks.

Using similar measures to those used by Lyttle and colleagues (2010), levels of perceptual and conceptual processing were assessed using word tasks.

However, the word-cue association task was conducted through audio techniques in order to be in line with the audio nature of the study. The word-stem completion task was replaced with a white-noise masked word-identification task, which although not commonly used in trauma-related studies, has shown good validity in measuring perceptual priming in cognitive psychology experiments (Schacter, 1992; Wiggs & Martin, 1998). This allowed an examination of the link between dissociation, cognitive information processing (i.e., perceptual and conceptual) and intrusions following the analogue traumatic stimuli.

Intrusion diaries were also utilised in the current study. The information gained from the intrusion diaries completed by participants subsequent to the experiment proper enabled comparisons between the two types of dissociation in terms of differences in the number of intrusions experienced between groups. This allowed an investigation into whether different types of dissociation produce different levels of memory intrusion. Measures of conceptual and perceptual priming allowed the comparison of the two types of information processing across dissociation types, and how these correspond to intrusions. The methodology of this study also enabled determination of whether auditory stimuli are a viable alternative to visual stimuli in psychotraumatology studies, something that, to the author's knowledge, has only been studied once thus far (Krans et al., 2010).

Aims and Hypotheses

Aim one: To explore whether an auditory-only version of the trauma-film paradigm could produce adequate levels of distress, comparable to the full trauma-film paradigm in a non-clinical population, allowing for the manipulation of dissociative symptoms through the use of visual tasks.

Aim two: To assess whether the two types of dissociation (compartmentalisation and detachment) could be experimentally separated and induced via the use of distinct visual tasks.

Aim three: To assess the theory regarding the differential processing biases that are connected to both dissociation in general, and the two theoretical forms of dissociation (compartmentalisation and detachment).

Hypothesis one: It was hypothesised that there would be quantitatively different experiences elicited by the different experimental conditions, and that these experiences could be measured using the Modified Peritraumatic Dissociative Experiences Questionnaire. Based on theoretical knowledge, those in the mirror observing group would experience more compartmentalisation-type dissociative symptoms and those in the spinning-dot group would experience more detachment-type dissociative symptoms.

Hypothesis two: 2a) It was hypothesised that those in the dissociation groups would show *greater* levels of perceptual priming than those in the neutral group. 2b) It was also expected that the dissociation groups would show *lower* levels of conceptual priming than those in the neutral group. 2c) It was also predicted that the two dissociation groups would show differences in conceptual and perceptual priming levels.

Hypothesis three: Those who experienced higher levels of perceptual priming and lower levels of conceptual priming (hypothesised to be in the two dissociation groups) would report higher levels of intrusions in the intrusion diary.

Methods

Participants

Participants were 60 students from the University of Canterbury, recruited during summer school 2012-13 and semester one of 2013. The sample size was chosen based on a power analysis using findings from previous research. Similar studies showed medium to large effect sizes of intrusions measured using a diary (Krans et al., 2010; Buck et al., 2009; Holmes et al., 2009; Bourne et al., 2010), and it was assumed that the effect sizes for intrusions would be similar in the current study. Using a conservative effect size of $d = .4$, three groups, and an alpha of .05, the power analysis (G*Power 3.1.2 software) indicated that a total sample size of 60 was needed to achieve 80% power. Secondary Tertiary Alignment Resource (STAR) students were excluded from the study, as they were typically under 18 years of age, and therefore fell into the exclusion criteria; there were no other exclusion criteria for participation.

The University of Canterbury Ethics Committee granted ethics approval prior to recruitment (Appendix A). Of the 60 participants, 24 volunteered as part of the first year participant pool, and were rewarded with course credits. The remaining 36 were recruited via departmental emails and advertisements posted around the Psychology department building. These participants were given a \$10 shopping voucher as incentive for participating in the study. All participants had either normal or corrected vision and hearing. Participant age ranged from 18 to 74 years ($M = 24.57$, $SD = 10.12$). Seventy eight per cent ($n = 47$) were female and 22% ($n = 13$) were male.

Materials

Audio Clips

Two auditory clips were used to manipulate analogue distress, both consisting of approximately seven minutes of edited film excerpts. One of these clips was designed to be neutral, while the other included more anxiety-evoking content. The neutral clip was compiled from the movie 'Chasing Amy' (1997; rated R16, but all offensive material was removed), and the anxiety clip was compiled from the movie 'Rendition' (2007; rated R16). The excerpts were selected based solely on their audio content, rather than their visuals, as they were converted to audio only for the study. The audio clips were edited using *iMovie '11*, with the content of the clips being selected based on the following criteria.

The first criterion was that the neutral clip had to be perceived as non-anxiety-inducing, and the threat clip had to be anxiety-inducing. The second was that both audio clips had to include spoken words that could be extracted and used in two post-audio word tasks. Selected audio extracts were chosen so that the target words from each audio clip that were used in assessment tasks were directly comparable in terms of frequency of use within the audio, as well as frequency of use within the English Language. Using the movie scripts to identify audio sequences that included the target words, these sequences were linked together without losing the overall cohesiveness of the story of the audio. The neutral audio clip story followed the personal life of an emerging artist trying to promote his new material. The threat audio clip presented a man who

was wrongly accused of an act of terrorism and was subjected to multiple torture methods.

Visual Tasks

Neutral Images (Control): During the audio clips, the control group had neutral images presented on a computer monitor placed directly in front of them. These neutral images had no relevance to the trauma or neutral audio stimuli and were used to control for any effects of watching a monitor (e.g. divided attention – hearing a story while watching a screen). These images were presented in random order using iMovie '11 software, and were displayed for 3 seconds each. The images were taken from the Geneva Affective Picture Database (GAPED) (Dan-Glauser & Scherer, 2011) and consisted of mostly inanimate objects, examples of these images are shown in Figure 2. The selected images had been previously found to be neutral in terms of both valence and arousal (Dan-Glauser & Scherer, 2011).



Figure 2. Examples of the neutral images presented during the audio task

Spinning-dot: Dot staring tasks have been used in multiple studies that have aimed to manipulate dissociation (Miller, Brown, DiNardo, & Barlow, 1994; Lickel, Nelson, Hayes-Lickel, & Deacon, 2008; Holmes, Brewin, & Hennessy, 2004). During dot staring tasks participants are typically asked to stare at a black dot presented on a white background (Holmes et al., 2004). However, the current study utilised a slightly more intensive stimulus, using video of a black dot surrounded by a series of spiraling/spinning lines, rather than the simple static image. This was used instead of the simple dot as it was thought to be more effective at keeping attention focused on the central dot. Figure 3 shows the stationary representation of the spinning-dot video used. This video was presented on a computer monitor placed directly in front of the participant and lasted the duration of the audio clips. The Spinning-dot video was taken from <http://quartzcomposer.com/>, on 21/5/2012. The dot staring task was expected to evoke more experiences of the detachment form of dissociation.

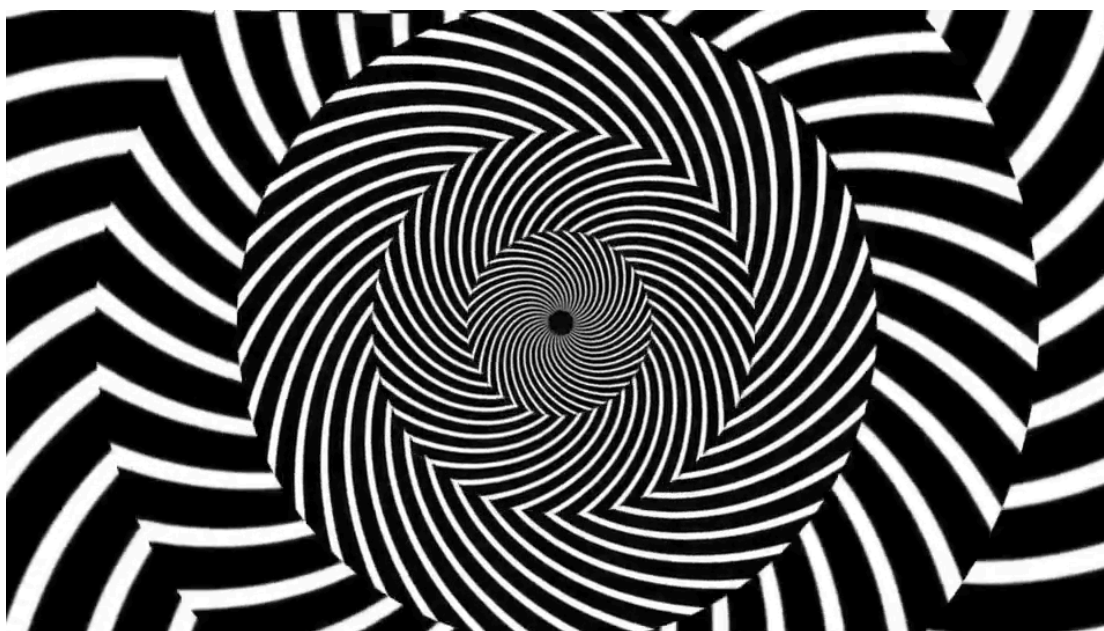


Figure 3. A stationary representation of the spinning-dot visual presentation

Mirror: In order to induce symptoms of compartmentalisation, the last visual task involved getting participants to look at themselves in a mirror during audio clip presentation. Looking into a mirror has previously been shown to induce compartmentalisation type dissociation (e.g., Caputo, 2010). A 30cm x 40cm mirror was placed against the computer monitor in front of the participants, who were instructed to sit still and stare intently at the reflection of their eyes for the duration of the audio clips.

Measures

Demographic Questionnaire

Demographic information was gathered from the participants before the audio task, and included age and gender. Appendix B contains the full Demographic Questionnaire.

Emotional Response Questions (ERQ)

Three measures were used to assess emotional reactivity before and after presentation of the audio clips. Current levels of depression, happiness and anger were assessed using 5-point Likert-scales. Participants were asked to rate each emotion *at this moment* on a scale ranging from 1 (very slightly or not at all) to 5 (extremely). This method is congruent with many studies in this field to assess levels of affectivity (Davies & Clark, 1998a). Appendix C contains the full Emotional Response Questionnaire.

Dissociation Tension Scale (DSS)

The *Dissoziations-Spannungs-Skala* (Dissociation Tension Scale (DSS); Stiglmayr, et al., 2010) is a self-rating assessment of psychological dissociative features occurring within the past 7 days. The DSS contains 21 items assessing trait dissociative symptoms and 1 additional item assessing aversive inner tension. Ratings are made on how often individuals experience each of the symptoms, over the past seven-days, on a scale ranging from 0% (never) to 100% (constantly). Questions include ratings of “*Feeling as if my body did not belong to me*” and “*I felt as if I was paralyzed, numbed*”. Appendix D contains the full list of questions used in the DSS. Evidence suggests that this assessment is a valid and reliable measure of dissociative symptoms over the past 7 days in both clinical and non-clinical populations. The DSS has a reliability of $\alpha = .92$ (Stiglmayr, et al., 2010). Overall total scores range from 0 to 2,200, with higher scores indicating higher levels of trait dissociation, including symptoms of depersonalisation, amnesia and derealisation (APA, 2013; Stiglmayr, et al., 2010).

State-Trait Anxiety Inventory (STAI)

The State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1983) is a widely used and validated measure of anxiety in clinical and non-clinical populations. The STAI consists of two separate 20-item self-report measures, with one assessing trait anxiety and the other state anxiety. Trait anxiety was measured using the trait subscale of the State-Trait Anxiety Inventory (STAI-T; Spielberger et al., 1983). State anxiety was measured using

the state subscale of the State-Trait Anxiety Inventory (STAI-S; Spielberger et al., 1983). The STAI-S assesses current anxiety levels, or how individuals are feeling 'right now, at this very moment', whereas the STAI-T assesses levels of anxiety 'generally' felt. Both subscales consist of 20 items relating to anxiety levels, using a 4-point scale ranging from 1 (not at all) to 4 (very much so). Both tests have been validated on a wide range of populations. The STAI-T has an internal consistency of $\alpha = .87$, and a test-retest reliability of .54, and the STAI-S has an internal consistency of $\alpha = .88$, and a test-retest reliability of .86 (Spielberger et al., 1983). The full STAI-S and STAI-T tests are provided in Appendix E and Appendix F. This assessment was used in the current study to control for the role of anxiety in priming and also to see whether the audio clip induced any recordable increase in anxiety (manipulation check).

Modified Peritraumatic Dissociative Experiences Questionnaire (PDEQ)

The original Peritraumatic Dissociative Experiences Questionnaire (PDEQ; Marmar, Weiss & Metzler, 1997) is a 10-item self-report questionnaire that measures the extent of dissociation at the time of the traumatic event, and shortly after (Marmar et al., 1997). Marshal and colleagues adapted the original PDEQ, shortening it to eight questions and thereby creating the Modified PDEQ (M-PDEQ; Marshal, Orlando, Jaycox, Foy & Belzberg, 2002). The wording of the M-PDEQ was further adapted for the current research to keep it relevant to the present study. For example, the last part of the following item was omitted, as they were in fact listening to a movie: "*What was happening didn't seem real, like I was in a dream or watching a movie*".

The 8-item M-PDEQ is scored from 1 (not at all true) to 5 (extremely true). Questions one, three and eight were all thought to theoretically relate to compartmentalisation-type dissociative symptoms, such as *“feeling separate from what was going on”, “being a spectator in your own body”* and *“gaps in memory”*. Questions two, four, five, six and seven were thought to address more detachment-type dissociative symptoms, such as *“things happening in slow motion”, “body distortions”, “feeling like I was trapped”, “felt confused”* and *“felt disorientated.”* The modified PDEQ was used in the current study to assess levels of dissociation in participants after audio stimuli, for the purpose of differentiating between the two hypothesised forms of dissociation. The PDEQ used in the current study is shown in Appendix G.

Post-Audio Measures of Commitment to Task

Post-audio self-report measures asked participants to report the extent to which they were able to give reasonable attention to the visual and audio elements of the study. The questions were worded: *On the following scale please indicate the extent to which you found the [interrogation]/[two authors] clip distressing*; and were rated on a 11-point scale, with 0 being *“not at all focused”*, and 10 being *“attention completely focused”*. Participants were also asked to report levels of distress for the neutral audio and threat audio: *On the following scale please indicate how much attention you were able to pay to the [audio clips]/[visual presentation] you just [heard]/[saw]*. This was rated on an 11-point scale, with 0 being *“not at all distressing”*, and 10 being *“extremely distressing”*. These questions acted as experimental controls for any difficulties that

participants may have experienced, as well as controlling for how distressing they found the two audio clips. Appendix H contains the full set of post-audio measures used in the current study.

Follow Up Questions

At the follow-up meeting, three to four days after hearing the audio stimuli, participants were asked the extent to which they felt they were able to record all intrusive memories in the diary, using an 11-point Likert scale from 0 (never remember to record intrusions) to 10 (always remembered to record intrusions).

Three questions were also asked relating to the audio clips: firstly whether they were aware that they were listening to extracts of movies, and the second and third addressed whether they had seen the movies *Chasing Amy* and *Rendition* at the time of the experiment. Participants either responded with 'yes', 'no' or 'not sure'. The full follow-up questionnaire is provided in Appendix I.

Assessment of Perceptual and Conceptual Processing

White-Noise Word Identification Task: The white-noise masked word-identification task was used to measure perceptual memory and priming (Deutsch & Bentin, 1994; Hermann, 1996; Ratcliff, Allbritton & McKoon, 1997). This task consists of presenting spoken words concurrent with white-noise interference, causing the words to become obscured. The level of this interference is reduced over time, such that the word becomes clearer. It is assumed that individuals with greater levels of perceptual priming, after

previously encoding the words, will identify the words faster than those who have lower levels of perceptual priming.

In the current study, eight words were taken from each of the audio scripts, and converted to audio. For more detail on the selected words, see the next section below. The word lists were presented in counterbalanced order (i.e. neutral then threat or threat then neutral) to control for any bias.

White-Noise Identification Task Words: All chosen words were present in only one of the audio clips in order to stop any cross priming. Both sets of words were representative of the overall theme of the audio, therefore threat-related words were selected from the threat clip and artist-related words were selected from the neutral clip. Even though some of the threat words may not seem threatening, they were used in a threatening way in the audio.

Word frequencies in English language were matched between the two word lists, with frequencies taken from the Corpus of Contemporary American English (taken from corpus.byu.edu/coca/a), compendium of 450 million words taken from 1990-2012; words used in the word lists had an overall mean frequency of approximately 78 words per million. The words selected from each of the audio scripts were matched by the number of times they were used in the audio clips, with each word being used an average of 2.31 times. The words in the white-noise task were also matched between the threat and the neutral words in the number of syllables; the selected words had a mean of two syllables. Simple one-way t-tests showed that the word lists did not significantly differ across frequency in language ($t(14) = .19, p = .85$), frequency within the clip ($t(14) = -.38, p = .71$), or number of syllables ($t(14) = .00, p = 1.00$).

The final words were then individually converted to speech using Mac OS 10.7 text to speech software. Due to the inability to find a New Zealand-English voice, a British-English voice was chosen due to its clarity compared to the alternatives. These words were then made into an audio file, with the selected word being repeated 10 times. There was an approximate 2-second interval between each word repetition, resulting in the total length of each word identification task lasting approximately 30 seconds. Computer sound engineer software (VirtualDJ Pro) was then used to add white noise over the top of the word, with the balance of white noise to word cross fade changing by 10% for each repetition of the word. This resulted in the initial repetition of the word having only 10% word and 90% white noise, through to the final repetition of 0% white noise and 100% word. The final word lists are presented in Appendix J.

Word-Cue Association Task: The word-cue association task is a test of conceptual priming by measuring priming for words that have been previously encoded (targets) using word cues that are associated with the target words. These word cues act as semantic retrieval cues. Responding with the target word from the cue word requires conceptual priming. Conceptual processing is demonstrated if the words heard during the audio clips are chosen over more commonly and closely associated words (Lyttle et al., 2010; Schacter & McGlynn, 1989). Previously presented words from the audio clips (targets) that were given in response to the cue word were marked as correct, as well as minor changes to these target words (such as pluralisation). The words used in the word-cue association task were also presented in counterbalanced order (threat; neutral).

Word-Cue Association Words: word frequencies in the English language were matched between the threat and neutral word lists, taken from the Corpus of Contemporary American English (corpus.byu.edu/coca/a) with a mean of approximately 67 words per million. The words from the clips were matched in the number of times they were used; with each word being said an average of 2.5 times. An associated word was chosen for each of the target words. These words were selected to be moderately associated with their target, with a mean association of 3.5 (all between the 3rd and 4th most commonly associated word). Word associations were taken from the Edinburgh Associative Thesaurus (EAT), accessed from <http://www.eat.rl.ac.uk/>, on 28/2/2012. Simple one-way t-tests showed no significant differences between the word lists across the frequency of use in the English language ($t(14) = .02, p = .98$), their frequency of use within the audio clips ($t(14) = .13, p = .90$), and the association relationship ($t(14) = .68, p = .51$). The final word lists are presented in the Appendix K.

Intrusion Diary

Intrusion diaries have been used extensively in the assessment of intrusive thoughts and images after experimental exposure to trauma (e.g., trauma film paradigm; Holmes et al, 2004). For three days after the current study, individuals were required to record any intrusions they experienced relating to the audio clips or the study. In addition to recording the number of intrusions, participants were asked to record the level of distress related to the intrusion using an 11-point scale from 0 (*not distressing*) to 10 (*extremely distressing*), as well as briefly describing the contents of the intrusion. This

method is a widely accepted measure of intrusive thoughts (Holmes & Steel, 2004; Laposa & Alden, 2006). Intrusions in this case were defined as '*any thoughts/memories/images about the clips occurring when you had not intended to*'. The template for the intrusion diary is presented in Appendix L.

Procedure

Participants were run through the study individually, in a lab room located on campus. Participants were randomly assigned to one of the three conditions, with the final sample consisting of 20 participants in the neutral images group, 19 participants in the spinning-dot group, and 21 participants in the mirror group.

Main Experiment

Pre-Audio: In the first stage of the experiment, participants read an information sheet outlining the potentially distressing nature of the audio clips, then signed a consent form acknowledging that they understood what the study involved. Participants were told to contact the researchers if they experienced any psychological distress in the time following the experiment. Information, consent and debriefing forms are provided in Appendices M, N and O, respectively. Participants then provided basic demographic information, and completed the following self-report questionnaires: the Emotional Response Questionnaire, the Dissociative Tension Scale (DSS), the State Anxiety Inventory (STAI-S) and the Trait Anxiety Index (STAI-T).

Prior to the commencement of the auditory and visual tasks, participants were given overviews of the audio clips to read, in order to introduce and add context to the audio clips. The paragraphs consisted of a brief description of each of the audio clips. The first paragraph explained that one audio clip consisted of a true story of a man wrongly convicted of a bombing, and described the torture methods that were being used on the victim. The second paragraph described the alternate audio clip, about an amateur artist trying to promote his new material and his attempt to balance his personal life and friendships. The full introduction to audio text is shown in Appendix P. When ready to begin the audio and visual tasks, participants were instructed to attend carefully to the audio presentations, and simultaneously pay attention to the visual presentation (i.e., looking at themselves in the mirror, looking at the spinning-dot or looking at the neutral pictures).

Audio: Participants then listened to both audio clips whilst either staring at a spinning-dot, a mirror showing themselves, or a set of neutral images. Both audio clips lasted approximately seven minutes and were presented in random order. The audio clips were played through Sony over-ear headphones at a constant volume. The experimenter left the room for the duration of the audio task so as not to disturb participants. Participants had an approximate one-minute gap between the audio clips where the audio clips were swapped manually by the experimenter. Participants were not required to do anything during this time.

Post-Audio: Immediately after the presentation of the audio, participants completed the Post-Audio Measures of Commitment to Task, the Emotional Response Questions, the STAI-S, and the PDEQ. Following this, all participants underwent the white-noise masked word identification task, and then the word-cue association task.

For the white-noise masked word identification task, participants were presented with the white-noise masked words, and instructed to say the word out loud as soon as they thought they knew what it was. If they were correct, the time was recorded and would then move on to the next word. If they were incorrect, they would keep trying to identify until they were correct. They were instructed that there was no limit to the number of attempts. The latency of correct identifications were recorded and tallied across all words in each category (neutral; threat), giving a total identification time for the neutral group of words, and for the threat words.

For the word-cue association task, participants were asked to say the first word that came into their head when they heard the cue word. The words from the two word lists were presented via headphones to the participant. Their responses were recorded and marked as 'correct' if they gave the target associated word exactly, or a slight variation of it (such as pluralisation). The word lists were presented in counterbalanced order.

In the final part of the main experiment stage, participants were given the intrusion diary and instructed how to use it. They were asked to record all intrusions experienced over the following three days, including the frequency and severity of the intrusions, and a brief description of their contents.

Follow Up

At a follow up three to four days later, participants returned the intrusion diaries and were fully debriefed, with any issues that had arisen during the course of the experiment addressed. They also completed the four follow-up questions controlling for diary compliance, whether they were aware they were watching extracts of movies, and whether they had seen the two movies used for the audio clips.

Analysis

The data was analysed using IBM's Statistical Package for Social Science (SPSS), version 21. After screening for missing values, the collated data were checked for univariate outliers, normality, linearity, and homoscedasticity. The results of these analyses are reported in each relevant portion of the results section. In general, minor violations of equal variances were ignored for the ANOVAs, as this method is robust to this violation as long as samples are of the same size (Field, 2005). In cases of moderate to severe differences in variance, these were either corrected using data transformation methods, or non-parametric analyses were used.

In view of the hypotheses posed in the current study and type of design used, the most appropriate statistical procedures differed between each hypothesis. An $\alpha = .05$ was the level of significance used in all tests. Throughout the analyses, two types of post-hoc tests were used depending on the context, either the Bonferonni for comparing groups based on *a priori*, or expected

patterns; or Tukey HSD for comparing groups based on post-hoc, or emerged patterns.

Due to very successful follow-up rates (100%) and no exclusions, all 60 participants were included in the analyses. One individual chose not to complete the DSS and so a sample of 59 was used for this measure; this participant was included for all other analyses.

Results

Experimental Controls

Age and Gender

Table 1 shows a breakdown of demographic information between the three conditions (neutral, spinning-dot, mirror) and as an overall total of the sample.

The age and gender composition of each of the three groups was compared to identify any potential bias. The three groups did not differ with respect to age, $F(2, 57) = 0.54, p = .59$, or gender, $\chi^2(2, N = 60) = 4.42, p = .11$.

Table 1

Demographic Information for Each of the Three Conditions and for the Overall Total

	Neutral Group	Spinning-dot Group	Mirror Group	Combined Total
N	20	19	21	60
Female (Male)	14 (6)	18 (1)	15 (6)	47 (13)
Mean Age	25.70	22.58	25.15	24.57
Median Age	23.00	20.00	21.00	21.00
Std. Dev. Age	9.04	7.27	13.10	10.12
Minimum Age	18	18	18	18
Maximum Age	50	43	74	74

Trait Anxiety and Dissociation

The three groups were also compared across levels of trait anxiety (STAI-T) and trait dissociation (DSS) to examine confounding trait effects. A one-way ANOVA suggested the three groups did not differ significantly across STAI-T scores, $F(2,57) = 0.21, p = .81$. The three groups also did not differ significantly across DSS scores, $F(2,56) = 0.55, p = .58$. Table 2 shows the STAI-T scores for

each of the three conditions and as an overall total. Table 3 shows the DSS scores for each of the three conditions and as an overall total.

Table 2

STAI-T Scores for Each of the Three Conditions and for the Combined Total

	Neutral Group	Spinning-dot Group	Mirror Group	Combined Total
N	20	19	21	60
Mean Sum	43.60	42.74	41.71	42.67
Median Sum	38.50	41.00	43.00	42.00
Std. Dev.	11.24	8.54	7.63	9.13
Minimum	27	30	29	27
Maximum	67	62	58	67

Table 3

DSS Scores for Each of the Three Conditions and for the Combined Total

	Neutral Group	Spinning-dot Group	Mirror Group	Combined Total
N	20	18	21	59
Mean Sum	185.25	142.50	169.76	166.69
Median Sum	180.00	125.00	150.00	160.00
Std. Dev.	116.86	131.96	131.08	125.72
Minimum	30	20	10	10
Maximum	460	550	440	550

Post-Audio Questions

Participants reported they were able to give reasonable attention to the visual ($M = 6.17$, $SD = 1.77$) and audio elements ($M = 7.52$, $SD = 1.55$) of the study, rated on a scale of 0-10 (with 10 being *attention completely focused*).

There were no differences found between the three groups for either the audio attention $F(2,57) = 0.37$, $p = .69$, or the visual attention $F(2,57) = 0.55$, $p = .58$.

Participants also reported significantly lower distress levels for the neutral audio ($M = 1.62$, $SD = 1.61$) than for the threat audio ($M = 6.95$, $SD =$

2.05), $t(59) = 21.23, p < .001$. Further analyses revealed no differences between the three groups for how distressing they reported the neutral audio clip to be $F(2,57) = 0.04, p = .97$, or the threat audio clip $F(2,57) = 0.34, p = .71$. Overall visual and audio attention scores are shown in Table 4, along with reported neutral and threat distress levels.

Table 4

Overall Ratings for Visual and Audio Attention and Reported Distress Levels of the Threat and Neutral Audio Clips

	PAQ¹ Attention Audio	PAQ Attention Visual	PAQ Neutral Distress	PAQ Threat Distress
N	60	60	60	60
Mean	7.52	6.17	1.62	6.95
Median	8.00	6.00	1.50	8.00
Std. Dev.	1.55	1.77	1.61	2.05
Minimum	3	3	0	0
Maximum	10	10	6	10

¹ Post-Audio Questions

Diary Compliance

Levels of compliance for completing the intrusion diary ranged from 2 to 10 (with 10 being complete compliance), with a relatively high mean compliance rating of 7.13 ($SD = 2.16$). No significant difference was found in the level of diary compliance between the three groups $F(2,57) = 0.55, p = .58$. Further information relating to compliance is presented in Table 5.

Table 5

Diary Compliance for Each of the Three Conditions and for the Combined Total

	Neutral Group	Spinning-dot Group	Mirror Group	Combined Total
N	20	19	21	60
Mean	6.80	7.52	7.10	7.13
Median	6.50	7.00	7.00	7.00
Std. Dev.	2.33	1.95	2.21	2.16
Minimum	3	3	2	2
Maximum	10	10	10	10

Controls of having Previously Seen the Movies

Approximately 35% ($n = 21$) of participants reported being aware that they were listening to extracts of movies. The remaining 65% reported either not knowing ($n = 33$) or being 'not sure' ($n = 6$). The proportions did not differ between experimental groups, $\chi^2(4, N = 60) = 2.76, p = .60$.

Only seven per cent ($n = 4$) of participants reported having seen the movie 'Chasing Amy', with the remaining 93% ($n = 56$) having not seen it. Only five per cent ($n = 3$) reported having seen 'Rendition', with one individual being 'not sure' and the remaining 93% having not seen it. The proportion of participants who reported having seen the movies 'Chasing Amy' and 'Rendition' did not differ between experimental groups, $\chi^2(2, N = 60) = 3.41, p = .18$, and $\chi^2(2, N = 60) = 3.94, p = .41$, respectively.

Manipulation Check/ Audio Impact

The first aim of the study (aim one) was to explore whether an auditory-only version of the trauma-film paradigm produced adequate levels of distress in order to be comparable to the full trauma-film paradigm in a non-clinical

population. Levels of affect and anxiety were assessed using pre- and post-audio measures of ERQ and STAI-S.

Emotional Response Questionnaires

The Emotional Response Questionnaire consisted of three questions, with participants rating their current levels of happiness, depressiveness and anger. These were taken before and after exposure to the audio clips. Due to violations of normality, non-parametric tests were used.

Related-samples Wilcoxon signed-ranked tests revealed a significant decrease in ERQ happiness levels between pre-audio ($M = 3.40, SD = 0.62$) and post audio ($M = 2.88, SD = 0.85$) scores, $Z = -4.12, p < .001$. An increase in ERQ depressed levels was also found between pre-audio ($M = 1.50, SD = 0.77$) and post-audio ($M = 1.87, SD = 0.85$) ratings, $Z = -2.99, p < .01$. In addition, an increase in ERQ anger levels was identified between pre-audio ($M = 1.22, SD = 0.56$) and post-audio ($M = 1.60, SD = 0.85$), $Z = -2.81, p < .01$. These findings suggest that the audio clips may have reduced the positive affect and increased negative affect in participants, thus indicating the desired effect of inducing distress. Given the content of the neutral audio clip, it was assumed these alterations in affect were the result of the threat clip. Table 6 shows the pre- and post- audio scores for each of the three emotional response questions.

Independent samples Kruskal-Wallis tests showed no significant difference in any of the emotional response questionnaires between the three groups, neither at pre-audio nor post-audio. No significant differences were found between groups for ERQ Happy pre-audio [$\chi^2(2, N = 60) = 0.25, p = .88$],

nor post-audio [$\chi^2(2, N = 60) = 4.78, p = .09$]; for ERQ Depressed pre-audio [$\chi^2(2, N = 60) = 1.87, p = .39$], nor post-audio [$\chi^2(2, N = 60) = 4.06, p = .13$]; nor for ERQ Angry pre-audio [$\chi^2(2, N = 60) = 0.58, p = .75$] nor post audio [$\chi^2(2, N = 60) = 3.17, p = .21$].

Table 6

Pre- and Post-Audio ERQ Scores for Levels of Happiness, Depressiveness and Anger

	Pre- Audio ERQ Happy	Post- Audio ERQ Happy	Pre- Audio ERQ Depressed	Post- Audio ERQ Depressed	Pre- Audio ERQ Angry	Post- Audio ERQ Angry
N	60	60	60	60	60	60
Mean	3.40	2.88	1.50	1.87	1.22	1.60
Median	3.00	3.00	1.00	2.00	1.00	1.00
Std. Dev.	0.62	0.85	0.77	0.85	0.56	0.85
Minimum	2	1	1	1	1	1
Maximum	4	5	4	4	4	4

State Anxiety

STAI-S scores were analysed to see whether general state anxiety increased after the audio clips, irrespective of condition. A paired-samples t-test showed that pre-audio STAI-S scores ($M = 36.48, SD = 10.65$) were significantly lower than post-audio scores ($M = 41.48, SD = 11.90$), $t(59) = -4.28, p < .001$.

Analysis showed no significant differences in pre-audio STAI-S scores between the three groups, $F(2,57) = 0.54, p = .59$, however the groups did significantly differ across post-audio STAI-S scores, $F(2,57) = 4.05, p < .05$. Post hoc comparisons using the Tukey HSD test indicated that the mean post-audio STAI-S score for the Spinning-dot condition ($M = 46.26, SD = 10.25$) was significantly different to the neutral condition ($M = 36.05, SD = 10.26$), $p < .05$.

However, the Mirror condition ($M = 42.33$, $SD = 13.09$) did not significantly differ from the neutral or spinning-dot conditions.

To determine if the tasks had an impact on anxiety levels, a mixed model ANOVA of STAI-S scores was conducted; a significant group-by-time interaction was found, $F(2,57) = 6.17$, $p < .01$. As shown in Figure 4, STAI-S scores in the neutral condition did not change between pre-audio and post audio, however, STAI-S scores increased from pre-audio to post-audio in both of the dissociation conditions. This suggests that the spinning-dot and mirror tasks had more of an impact on anxiety levels than the neutral condition.

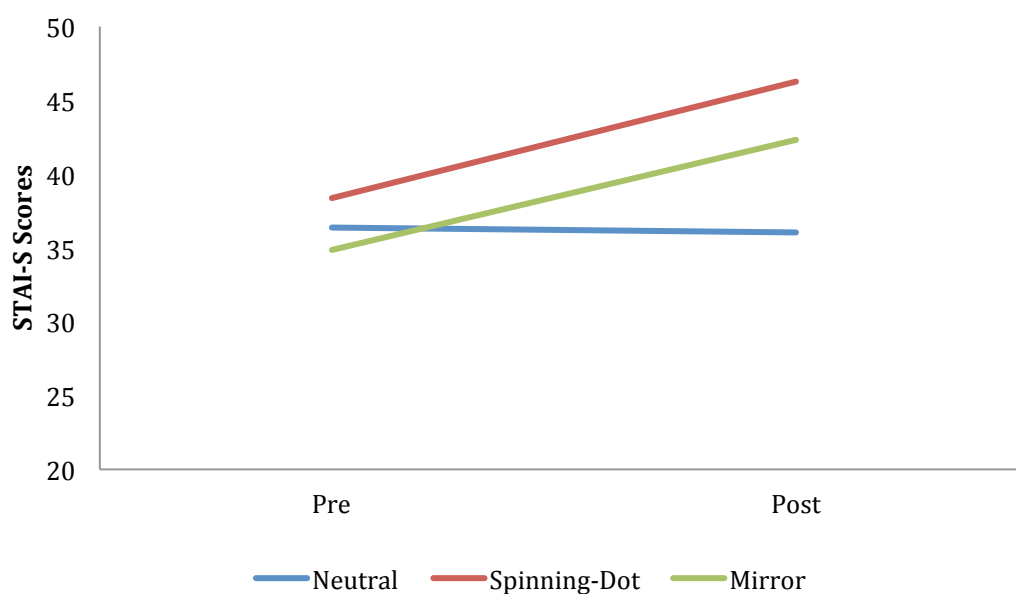


Figure 4. Mean STAI-S scores at pre-audio and post-audio, by condition.

Unsurprisingly, both pre- and post-audio measures of state anxiety correlated to trait anxiety scores. Pre-audio STAI-S was found to be strongly positively correlated with STAI-T, Pearson's $r(60) = .72$, $p < .001$, and post-audio STAI-S was moderately positively correlated with STAI-T, Pearson's $r(60) = .41$,

$p < .001$. STAI-S scores for each of the three conditions and the combined total are shown in Table 7 for pre-audio and Table 8 for post-audio. These analyses suggest an all round increase state anxiety, suggesting that the audio did have the intended effect.

Table 7

Pre-Audio STAI-S Scores for Each of the Three Conditions and for the Combined Total

	Neutral Group	Spinning-dot Group	Mirror Group	Combined Total
N	20	19	21	60
Mean Sum	36.40	38.37	34.86	36.48
Median Sum	32.00	36.00	36.00	35.50
Std. Dev.	12.39	10.68	8.94	10.65
Minimum	21	21	20	20
Maximum	67	63	54	67

Table 8

Post-Audio STAI-S Scores for Each of the Three Conditions and for the Combined Total

	Neutral Group	Spinning-dot Group	Mirror Group	Combined Total
N	20	19	21	60
Mean Sum	36.05	46.26	42.33	41.48
Median Sum	35	48	41	39.50
Std. Dev.	10.26	10.25	13.09	11.90
Minimum	20	25	21	20
Maximum	64	65	63	65

Manipulation of Two Distinct Forms of Dissociation

It was proposed (aim two) that there would be quantitatively different dissociative experiences elicited by the different experimental conditions, and

that these experiences could be measured using the Modified Peritraumatic Dissociative Experiences Questionnaire. Second, and more specifically, it was hypothesised that those in the mirror group would experience more compartmentalisation-type dissociative symptoms and those in the spinning-dot group would experience more detachment-type dissociative symptoms (hypothesis one).

In order to determine if there were any differences between the groups in terms of overall peritraumatic dissociation, a one-way ANOVA was conducted for total PDEQ scores. The three experimental conditions were significantly different in terms of total PDEQ scores, $F(2,57) = 8.12, p < .001$. Post hoc comparisons using the Bonferroni test indicated that the overall mean PDEQ scores for the spinning-dot ($M = 20.21, SD = 6.24$) and mirror ($M = 18.10, SD = 6.46$) conditions were significantly different to the neutral condition ($M = 12.90, SD = 4.70$), $p < .001$ and $p < .05$ respectively. The spinning-dot condition and the mirror groups did not significantly differ from one another ($p = .78$). Table 9 shows the PDEQ scores for each condition as well as the combined total.

There was a small to medium positive correlation found between DSS scores and total PDEQ scores, Pearson's $r(59) = .27, p < .05$. However, there was still a significant difference in PDEQ scores between the three groups after controlling for DSS, $F(2,53) = 4.41, p < .05$.

Table 9

PDEQ Scores for Each of the Three Conditions and the Combined Total

	Neutral Group	Spinning-dot Group	Mirror Group	Combined Total
N	20	19	21	60
Mean Sum	12.90	20.21	18.10	17.03
Median Sum	12.00	19.00	18.00	15.50
Std. Dev.	4.70	6.24	6.46	6.53
Minimum	8	11	10	8
Maximum	29	34	32	34

To address the second part of the hypothesis - that two forms of dissociation could be elicited in the participants - the two experimental/dissociation groups were compared across the two proposed categories of the PDEQ: compartmental and detachment. The eight items of the PDEQ were assigned to one of two dissociation categories as described in the Methods section. The neutral group was excluded from these analyses, as this group was not relevant in directly addressing the hypothesis.

Independent samples t-tests indicated that there was no significant difference between the spinning-dot and the mirror groups across the compartmentalisation category [$t(38) = .72, p = .47$], nor the detachment category [$t(38) = 1.12, p = .27$] of the PDEQ. Table 10 shows the means and standard deviations for the spinning-dot and mirror conditions across PDEQ category.

Table 10

Means (and SD) for the Spinning-Dot and Mirror Conditions across PDEQ Category.

	Spinning-dot Group	Mirror Group
PDEQ Detachment	12.37 (4.10)	10.86 (4.41)
PDEQ Compartment.	7.84 (2.56)	7.24 (2.70)

The differentiation of compartmentalisation and detachment items on the modified PDEQ was theoretically-driven. To examine the statistical evidence for this differentiation, a factor analysis was conducted to test whether the individual components of the PDEQ grouped together as predicted. Individual PDEQ items violated normality and were therefore transformed using natural logarithm.

Initially, the suitability of factor analysis for the 8 PDEQ items was examined (using a principal components analysis). Several well-recognised criteria for the factorability of a correlation were used. Firstly, it was observed that all eight items of the PDEQ correlated at least 0.5 with at least one other item. In addition, Bartlett's test of sphericity was significant ($\chi^2 (28) = 203.29, p < .001$) and the Kaiser-Meyer-Olkin measure of sampling adequacy was .85. The diagonals of the antiimage correlation matrix were also all over 0.8. Finally, the communalities were all above 0.5, indicating that items shared some common variance. Given these overall indicators, all 8 items displayed adequate factorability (Field, 2005).

The scree plot indicated that a clear two-factor solution was the best fit for the data, which was congruent with the theoretical hypothesis. Eigen values indicated that the first two factors explained 52.8% (eigenvalue = 4.22), and 67.1% (eigenvalue = 1.14) of the variance, respectively; the remaining factors each had eigenvalues below one. Varimax rotation was used as it provided the best-defined structure. The full statements for each item of the PDEQ are presented in Appendix G, but for ease of this analysis they will be referred to as their items number in this section.

All items had primary loadings over 0.5, however PDEQ2 had a cross loading of over 0.5 on both factors and was therefore removed from the final analysis. PDEQ5 and PDEQ7 also had cross-loadings above 0.3, but both had a strong primary loading of over 0.6 so they remained included. The factor loading matrix for this solution is presented in Table 11.

Table 11

Varimax Rotated PDEQ Item Loadings Across Two Factors

	Factor 1	Factor 2
Item 1: 'Blanked out'	.246	.860
Item 2: 'Time changed'*	.568	.546
Item 3: 'Spectator'	.847	.073
Item 4: 'Body distortion'	.813	.233
Item 5: 'Things happening to me'	.675	.304
Item 6: 'Confused'	.192	.755
Item 7: 'Disorientated'	.773	.320
Item 8: 'Gaps in memory'	.197	.782

*Item 2 was excluded from this analysis.

Based on theoretical assumptions, items 2, 4, 5, 6 and 7 were thought to reflect the *detachment* category, and items 1, 3 and 8 the *compartmental* category. The factor analysis did not concur completely with this differentiation. Items 3, 4, 5 and 7 statistically loaded on factor 1, and items 1, 6 and 8 on factor 2. Factor 1 contained most of the items thought to measure detachment, but also included item 3; this item was theorised to assess compartmentalisation, because it depicts ego-observing experiences implying the compartmentalisation of experiences (Steele et al., 2009). For Factor 2, the items more strongly seem to assess compartmentalisation, except item 6, which looks more clearly like detachment.

To overcome the statistical-theoretical impasse, comparisons between spinning dot and mirror conditions were conducted on 2 different measures of detachment and compartmentalisation. The first was directly from the factor analysis (i.e., items 3, 4, 5, 7 versus items 1, 6, 8). The second was with the grouping that both theory and the factor analysis agreed on, thus the analyses were conducted using items 4, 5 and 7 as measures of detachment dissociation, and items 1 and 8 as measures of compartmentalisation. For the factor analysis results, no significant differences were found across conditions for detachment or compartmentalisation. Independent samples t-tests indicated that there was no significant difference between the spinning-dot and the mirror groups across the first factor identified by the factor analysis [$t(38) = 0.43, p = .67$], nor the second factor identified [$t(38) = 1.41, p = .17$]. Table 12 shows the means and standard deviations for the spinning-dot and mirror conditions across the factor analysis components.

Table 12

Means (and SD) for the Spinning-Dot and Mirror Conditions across the Factor Analysis Proposed Components

	Spinning-dot Group	Mirror Group
Factor 1	8.00 (3.71)	7.48 (3.93)
Factor 2	9.16 (2.63)	8.00 (2.55)

The same was evident for the combined theory-factor analysis differentiation. Independent samples t-tests indicated that there was no significant difference between the spinning-dot and the mirror groups across the new detachment component [$t(38) = 0.06, p = .80$], or the compartmental category [$t(38) = 1.05, p = .30$]. Table 13 shows the means and standard

deviations for the spinning-dot and mirror conditions across the combined differentiation.

Table 13

Means (and SD) for the Spinning-Dot and Mirror Conditions Across the Combined Differentiation Components

	Spinning-dot Group	Mirror Group
Component 1 (Det.)	6.00 (2.85)	5.43 (2.89)
Component 2 (Comp.)	5.84 (2.06)	5.19 (1.86)

Conceptual and Perceptual Priming

It was hypothesised (hypothesis two) that those in the experimental groups designed to induce dissociation would show *greater* levels of perceptual priming than those in the neutral group. It was also expected that the dissociation groups would show *lower* levels of conceptual priming than those in the neutral group. It is also predicted that the two dissociation groups may show differences in conceptual and perceptual priming levels.

Word-Cue Task

The word cue association task (conceptual priming measure) was scored by the total number of correct target words given by the participant in response to a cue word. There were eight words from the neutral audio and eight words from the threat audio, resulting in a total of 16 possible correct answers. The word cue association task suffered from low correct responses in the neutral category, which resulted in a large positive skew in the data. One extreme outlier

was excluded as it exceeded the benchmarked 2.5 standard deviations from the mean.

A logarithm transformation was applied to the threat and neutral word cue scores, but the data still violated normality (and homogeneity of variance) so a non-parametric test was used on the non-transformed data. Wilcoxon's matched pairs signed-ranks test showed that there were significantly more correct responses for the threat words (Median = 3; Mean = 2.09, SD = 1.33) compared to the neutral words (Median = 0; Mean = 0.39, SD = 0.74), $Z = -5.47$, $p < .001$. This suggests that individuals were more likely to give the correct target word for the threat words compared to the neutral words. It is important to bear in mind the possible bias in these responses, which are explained in the Discussion. Table 14 shows the word-cue scores for the neutral and threat words, as well as a combined total.

Table 14

Word-Cue Scores for the Neutral and Threat Word Categories, and the Combined Total

	Word Cue Neutral	Word Cue Threat	Word Cue Total
N	59*	59*	59*
Mean Sum	0.39	2.09	2.47
Median Sum	0.00	2.00	3.00
Std. Dev.	0.74	1.33	1.30
Minimum	0	0	0
Maximum	3	5	5

*One outlier excluded from Word Cue, was > 2.5 SDs.

Independent samples Kruskal-Wallis tests showed no significant differences between the three groups for the neutral word-cue scores ($Z = 0.05$, $p = .98$), threat word-cue scores ($Z = 0.89$, $p = .64$), or total word-cue scores ($Z =$

0.40, $p = .82$). The overall word-cue scores for each of the three groups are shown in Table 15.

Table 15

Word-Cue Scores for Each of the Three Conditions

	Neutral Group	Spinning-dot Group	Mirror Group
N	20	18*	21
Mean Sum	2.50	2.67	2.29
Median Sum	2.50	2.50	3.00
Std. Dev.	1.40	1.28	1.27
Minimum	0	1	0
Maximum	4	5	4

*One outlier excluded from Word Cue, was > 2.5 SDs.

White-Noise Task

The white-noise word-identification task (perceptual priming measure) was scored using the time taken to identify a word correctly from the background static noise. Eight words were used from each of the audio clips, resulting in a total of 16 words. The time taken to identify each word correctly was then tallied to give a total for each category (neutral and threat) as well as an overall total time. One-way ANOVAs signalled significant differences between the three groups for the overall total white-noise score, $F(2,57) = 3.58$, $p < .05$.

Post hoc comparisons using the Bonferroni test showed differences between the two experimental conditions and the neutral condition on word identification, which were approaching significance. The difference between the mean white-noise total scores for the Spinning-dot condition ($M = 278.32$, $SD = 36.79$) and mirror condition ($M = 280.76$, $SD = 37.63$) compared to the neutral condition ($M = 304.65$, $SD = 27.61$), were approaching significance ($p = .60$ and $p = .70$, respectively). Combining the two experimental conditions (spinning-dot

and mirror) made the difference in white-noise scores between the experimental conditions and the neutral group significant ($t(58) = 2.69, p < .01$). No difference was found between the mirror and spinning-dot conditions ($p = 1.00$). Table 16 shows the total white-noise scores for each of the three conditions and the combined total.

Table 16

Total White-Noise Scores for Each of the Three Conditions and the Combined Total

	Neutral Group	Spinning-dot Group	Mirror Group	Combined Total
N	20	19	21	60
Mean Sum	304.65	278.32	280.76	287.95
Median Sum	302.00	295.00	280.00	293.5
Std. Dev.	27.61	36.79	37.63	35.79
Minimum	253	197	220	197
Maximum	350	323	351	351

When broken down into the two categories, significant between-group differences were only found for threat words ($F(2,57) = 4.84, p < .05$), and not for the neutral words ($F(2,57) = 1.33, p = .27$). Post hoc comparisons using the Bonferroni test indicated that the mean white-noise threat score for the Spinning-dot condition ($M = 134.53, SD = 22.70$) and mirror condition ($M = 135.10, SD = 22.99$) were significantly faster than the neutral condition ($M = 152.50, SD = 15.73$), both $p < .05$. No difference was found between the mirror and spinning-dot conditions, $p = 1.00$. Table 17 shows the threat words white-noise scores for each of the three conditions and the combined total. The neutral only white-noise scores for each of the three conditions are shown in Appendix Q. These results suggest participants in the two dissociation conditions took a

shorter amount of time to identify the threat words in the task than the participants in the neutral group.

Table 17

Threat-Word Only White-Noise Scores for Each of the Three Conditions and the Combined Total

	Neutral Group	Spinning-dot Group	Mirror Group	Combined Total
N	20	19	21	60
Mean Sum	152.50	134.53	135.10	140.72
Median Sum	149.50	142.00	130.00	144.00
Std. Dev.	15.73	22.70	22.99	22.06
Minimum	122	84	98	84
Maximum	180	164	180	180

In order to further explore the relationship between conceptual and perceptual priming, a correlation between the two tasks was conducted. A small to medium significant negative correlation was found between the word-cue and white-noise tasks, Pearson's $r(60) = -.26, p < .05$. This shows that those who scored higher on the perceptual task tended to score lower on the conceptual task. However, it is clear from the small correlation, that these constructs are not closely overlapped.

Diary

It was hypothesised (hypothesis three) those that who experienced higher levels of perceptual priming and lower levels of conceptual priming (hypothesised to be in the two dissociation groups) would report higher levels of intrusions in the intrusion diary.

Number of Intrusions

To address this hypothesis, total number of intrusions for each of the three days of the diary were tallied, and then compared between the three experimental conditions. No significant differences were identified between the three groups on day one, $[F(2,57) = 2.49, p = .09]$, day two $[F(2,57) = 0.52, p = .60]$, day three $[F(2,57) = .801, p = .454]$ or across all days combined $[F(2,57) = 1.47, p = .24]$. Table 18 shows the overall number of intrusions reported for each of the three days of the diary and the total number for all three days combined.

Table 18

Overall Total Number of Intrusions by Day and in Total (All Participants)

	Day 1	Day 2	Day 3	Total
N	60	60	60	60
Mean Sum	1.33	.92	.53	2.78
Median Sum	1.00	1.00	0.00	3.00
Std. Dev.	0.99	0.94	0.79	5.02
Minimum	0	0	0	0
Maximum	4	4	3	10

In order to create a more sensitive measure, another analysis was conducted which included only those participants who had one or more intrusions. However, this analysis also failed to show any significant differences between groups on day one $[F(2,48) = 1.33, p = .27]$, day two $[F(2,35) = 0.66, p = .52]$, day three $[F(2,20) = 0.47, p = .63]$, or in total $[F(2,50) = 0.72, p = .49]$. Table 19 shows the overall total number of intrusions by day and in total, excluding those who had no intrusions.

Table 19

Overall Total Number of Intrusions by Day and in Total, Excluding Those Who Experienced No Intrusions

	Day 1	Day 2	Day 3	Total
N	51	38	23	53
Mean Sum	1.57	1.45	1.32	3.15
Median Sum	1.00	1.00	1.00	3.00
Std. Dev.	0.77	0.80	0.66	2.12
Minimum	1	1	1	1
Maximum	4	4	3	10

As no differences were found between any of the three groups for total number of intrusions, a regression analysis was conducted to determine whether levels of conceptual or perceptual priming were predictive of intrusion numbers (irrespective of group membership). Word-cue and white-noise scores accounted for less than 1% of the variance in total number of intrusions ($R^2 = .008$), which was not significant, $F(2,57) = 0.22, p = .80$.

Severity of Intrusions

The mean severity of all intrusions throughout each day were calculated and compared between the three conditions. This data violated normality so non-parametric testing was used. Independent samples Kruskal-Wallis tests showed no significant difference in severity between the three groups on day 1 [$\chi^2(2, N = 51) = 5.37, p = .07$], day 2 [$\chi^2(2, N = 38) = 2.51, p = .29$], or day 3 [$\chi^2(2, N = 22) = 1.75, p = .42$]. However there was a significant difference found for the total mean across all three days, $\chi^2(2, N = 53) = 6.48, p < .05$. Table 20 shows the severity of intrusions for each day and the combined mean severity for all three days.

Table 20

Severity of Intrusions by Day and the Combined Mean of All Days

	Day 1	Day 2	Day 3	Combined
N	51	38	22*	53**
Mean	2.98	2.90	3.05	2.87
Median	3.00	3.00	3.00	2.50
Std. Dev.	2.22	2.09	2.11	1.93
Minimum	0	0	0	0
Maximum	7	7	7	7

*One outlier removed (no.13), was > 2.5 SDs from the mean.

**One outlier removed (no.21), was > 2.5 SDs from the mean.

It has already been shown that the dissociation groups experienced significantly more perceptual priming than the neutral group. The two dissociation groups did not differ significantly in terms of severity of intrusions, and so these two groups were therefore combined for the post hoc analysis. An independent samples Mann-Whitney U test indicated that the neutral group had less severe intrusions than the combined dissociation groups, $U = 169.50$, $Z = -2.46$, $p < .05$, $r = .2328$. Table 21 shows the combined mean severity of intrusions across the three conditions.

Table 21

Combined Severity of Intrusions Across the Three Conditions

	Neutral Group	Spinning-dot Group	Mirror Group
N	16	18	19*
Mean	1.96	3.44	3.10
Median	1.30	3.85	3.00
Std. Dev.	1.99	1.76	1.87
Minimum	0.00	0.00	0.00
Maximum	7.00	6.70	6.50

*One outlier removed (no.21), was > 2.5 SDs from the mean.

Discussion

The present study sought to further the understanding of dissociation in the development of PTSD, by experimentally separating and inducing two proposed forms of dissociation (compartmentalisation and detachment) and measuring subsequent intrusions. To our knowledge, no studies to date have experimentally attempted to induce and compare the two forms of dissociation and this is only the second study to use an audio-only version of the Trauma Film Paradigm. Using an audio-only version allowed for the introduction of concurrent visual tasks to the experimental procedure, which enabled the current study to assess new techniques in experimentally manipulating dissociation. The current study found that the audio traumatic stimuli increased levels of negative affect and state anxiety, reduced levels of positive affect, and induced substantial levels of intrusions in participants, thus supporting the idea that an audio-only version of the trauma film paradigm is a viable alternative to the audio-visual version.

The use of audio stimuli allowed the current study to explore two types of dissociation using two visual tasks; this distinguishes the current study from past research, which generally used only one task, and was therefore unable to manipulate dissociation types. In order to explore the theorised types of dissociation, three different groups were exposed to the same movie-extracted auditory stimuli. Concurrent with these audio clips, participants attended to visual tasks designed to produce different types of dissociation. The spinning-dot task has been shown to induce detachment-like symptoms (Lickel et al, 2008), while the mirror staring task has been shown to produce compartmentalisation-

type phenomena (Spitzer et al, 2006; Brugger, 2002; Caputo, 2010). These experimental manipulations enabled further investigation into whether it is possible to experimentally separate the different forms of dissociation through the use of specific visual tasks. Overall, a factor analysis indicated that a two-factor model was the best fit for the PDEQ items, showing support for the dichotomy of dissociation. However, significant differences in PDEQ scores were not found between the dissociation conditions, suggesting that the current experiment was not successful in eliciting the different types of dissociation through the use of the two visual tasks.

The next section of the study aimed to experimentally assess the link between types of processing and intrusions post-trauma. Following a similar conceptual processing measure to that used by Lyttle and colleagues (2010), levels of conceptual priming were assessed using a word-cue association task. In terms of assessing perceptual processing, the current study applied a method from the wider field of cognitive psychology (white-noise task) and showed its effectiveness for the assessment in the more specific area of dissociation and PTSD development. Using these assessment methods, greater levels of perceptual priming was found for the dissociation conditions than the neutral group. No significant differences were found between the dissociation conditions and the neutral group for conceptual priming. However, results showed that higher levels of conceptual priming were connected to the threat-related words compared with the neutral words, irrespective of group membership. No significant differences were found between the two dissociation conditions for either perceptual or conceptual priming.

Intrusions in the current study were assessed via the use of an intrusion diary, in terms of both frequency and severity of intrusions over three days; this is a similar methodology used by many other studies in this area (Holmes & Bourne, 2008; Buck et al., 2009; Hagenaars et al., 2008). This allowed for further examination of the link between cognitive information processing (i.e., perceptual and conceptual) and intrusions for the detachment group compared to the compartmentalisation group, and for both the dissociation groups combined. Significant differences were found between the combined dissociation conditions and the neutral group with regards to the severity of intrusions experienced; those in the dissociation conditions showed higher levels of distress related to their intrusions than the neutral group. However, perceptual and conceptual priming were not a significant predictor of number or severity of intrusions, and no differences were found between the two dissociation groups in either severity or number of intrusions.

All findings are discussed below with regards to the individual aims and hypotheses of the research.

Aim One: Assessment of audio-only trauma paradigm

The first aim of the current study was to explore whether an auditory-only version of the trauma-film paradigm produced adequate levels of distress, comparable to the full trauma-film paradigm in a non-clinical population.

After presentation of the audio clips, individuals experienced higher levels of anger and depressiveness, and lower levels of happiness than they did before the audio. Overall levels of state anxiety also increased significantly from

pre- to post-audio. Participants were not exposed to any manipulations between the pre- and post-audio questionnaires other than listening to the audio clips and attending to the visual tasks; in addition, participants reported significantly lower distress levels for the neutral audio than for the threat audio. On the basis of this, it can be confidently assumed that the audio clip was the cause of these changes.

Further analyses revealed no differences between the three groups for how distressing they reported the neutral audio, or the threat audio.

Unsurprisingly, both pre- and post-audio measures of state anxiety correlated with trait anxiety scores. This is to be expected, as those predisposed to higher levels of anxiety would likely report higher levels of state anxiety as a result of exposure to threat situations (Seligman, Walker & Rosenham, 2001).

One interesting result that arose was the identified interaction between experimental condition and state anxiety; more specifically, those in the neutral group did not display the same increase in state anxiety that the two experimental groups displayed. This suggests that the visual manipulations (mirror and spinning dot) may act to exacerbate anxiety. This is congruent with the additional finding that those in the experimental conditions experienced greater levels of dissociation; these experiences of dissociation may have caused confusion/anxiety in and of themselves, or alternatively, anxiety caused by the tasks may have lead to the increases in dissociation (APA, 2013). The main analyses (state dissociation, perceptual and conceptual priming, and intrusions) were re-run after controlling for state anxiety, and no significant differences were found compared with the original analyses. Further assessment of the role of anxiety in dissociation and subsequent intrusions is needed; this could be

achieved through the use of a condition that induces both anxiety and dissociation, and then comparing intrusion levels to an anxiety-only condition.

Overall, the audio clips reduced positive affect and increased negative affect, thus indicating that the audio was successful in inducing distress. The audio-only adaptation of the trauma film paradigm was also shown in this study to induce significant levels of intrusions and flashbacks (discussed in a later section). Given the audio-only paradigm is a viable tool for inducing analogue threat, further efforts could be made in perfecting the content and presentation of audio to further enhance the effectiveness of this methodology.

Aim Two/Hypothesis One: Differentiating two types of dissociation

An additional aim was to assess whether the two proposed types of dissociation (compartmentalisation and detachment) could be experimentally separated and induced via the use of distinct visual tasks. As such, it was hypothesised that there would be quantitatively different experiences elicited by the different experimental conditions, and that these experiences could be measured using the PDEQ. Based on theoretical knowledge, those in the mirror-observing group would experience more compartmentalisation-type dissociative symptoms, and those in the spinning-dot group would experience more detachment-type dissociative symptoms.

Significant differences were found for total PDEQ scores between the dissociation conditions and the neutral group, which indicates higher levels of dissociative symptoms amongst individuals in the two dissociation groups. These differences were still apparent after controlling for trait dissociation, and

suggest that the two dissociation conditions induced significantly more symptoms of dissociation than did the control condition. This finding supports the idea that experimental dissociation-inducing techniques are capable of inducing peritraumatic dissociation during analogue trauma paradigms, as has been shown in other studies (Lickel et al., 2008; Holmes et al., 2006). While the dot-staring task has previously been shown to produce dissociation in a number of studies (Leonard et al., 1999; Miller et al., 1994), the mirror-staring task is a much less widely used technique (Caputo, 2010). Thus, the current study adds to the growing body of literature indicating that the mirror-staring task is also capable of experimentally eliciting dissociation in general.

No significant differences in total PDEQ scores were found between the two experimental conditions. This result is to be expected, as the PDEQ measures both forms of proposed dissociation, with a mixture of different items relating to the different theorised types of dissociation being included within the same measure.

Factor analysis on the PDEQ showed that the items fell into two categories, generally consistent with the dichotomy of detachment and compartmentalisation in dissociation theory. Congruent with theory-based expectations, the factor analysis grouped items 1 (blanking out/losing track) and 8 (gaps in memory) together; these were previously predicted to be measures of compartmentalisation. Items 4 (body distortions/disconnect), 5 (feeling trapped/things happening to others were happening to me) and 7 (disorientated) together loaded onto the second factor, congruent with detachment. However, contrary to predictions, the factor analysis identified item 3 (spectator/observing myself) as being more closely related to the detachment-

type symptoms and item 6 (confused/difficulty making sense) as loading onto the compartmentalisation factor. Further, the results showed that item 2 (sense of time changed) factored highly with both groups, rather than with the detachment category as predicted.

Previous research in the field of dissociation has shown that it is difficult to experimentally isolate compartmentalisation from symptoms of detachment (Steele et al., 2009; Huntjens et al., 2013), which could explain why item 6 and item 2 did not load as expected. Therefore, it is likely that those in the compartmentalisation group would still be experiencing symptoms of detachment when they are staring at themselves in the mirror. This is supported by items 5 and 6 having strong cross loadings, suggesting that those in the compartmentalisation groups also experienced symptoms of detachment.

The reason for item 3 factoring with detachment is harder to ascertain. Item 3 was predicted to relate to compartmentalisation because it measures ego-observing experiences. The mirror task has also previously been shown to produce ego-observing symptoms (Spitzer et al, 2006; Brugger, 2002), which are seen by some researchers as one of the hallmark experiences during compartmentalisation-type dissociation (Steele et al., 2009; Hagenaars, et al., 2008; Stuart et al., 2006). Other researchers have suggested that ego-observing is more a symptom of compartmentalisation as it depicts depersonalisation (Holmes et al., 2005; Holmes et al, 2006; Brown, 2006). The findings in this study support the latter idea, that ego-observing phenomena may be more closely linked to detachment than compartmentalisation. The exact spinning-dot visual used in this study varied slightly to those used in other studies to induce detachment - which have typically used a static rather than animated dot - and

could explain this finding. Further investigation is required to validate this type of visual task in the creation of detachment in isolation, given the current indication that it may also create ego-observing compartmentalisation.

The PDEQ responses of participants in both of the dissociation groups were analysed after assigning the PDEQ items to two separate categories. The first analysis grouped the items into detachment items and compartmentalisation items on the basis of theoretical expectations (i.e., item 3 in the compartmentalisation category and items 2 and 6 in the detachment category). The second analysis looked at responses to items categorised according to the two factors identified in the factor analysis. Lastly, responses were analysed according to categories based on a combination of these two classifications, whereby only the items that were identified as belonging to the same category by both the theoretical expectations and the factor analysis were included.

Contrary to our hypothesis, no differences were found between the two experimental conditions when the questions of the PDEQ were assigned to one of the two proposed categories in any of the three ways outlined above. This result could be due to a number of factors, including that the PDEQ is not sensitive enough to identify and separate the two forms of dissociation. Additionally, there is the possibility that the visual tasks were not adequate in inducing the two distinct forms of dissociation; this is entirely plausible, given the difficulty mentioned above in experimentally differentiating between the two types. It is also likely, as mentioned above, that both inductions of dissociation evoke both types of dissociation. This would suggest that it is difficult to isolate one form from the other.

Although it was not possible to induce the two forms of dissociation using the visual manipulations of the spinning-dot-staring and mirror-staring tasks, factor analysis did identify two distinct forms of dissociation in this study. These results indicate that qualitatively different experiences could be measured by the PDEQ, but that these differences in experience were not associated with the specific experimental conditions. In addition, the audio task induced higher levels of dissociation and distress in the experimental conditions compared with neutral condition. Therefore, the results indicate that whilst two forms of dissociation exist, the current study was not able to experimentally manipulate and differentially induce them. There is a need to find a different way of manipulating or inducing compartmentalisation that is less contaminated with symptoms of detachment, and vice versa.

Future studies could also include alternative measures of state dissociation in order to further validate the use of the mirror task in inducing compartmentalisation-type dissociation.

Aim Three/Hypothesis Two: Cognitive processing

In line with previous literature, it was hypothesised (a) that those in the dissociation groups would show *greater* levels of perceptual priming than those in the neutral group; (b) that the dissociation groups would show *lower* levels of conceptual priming than those in the neutral group; and (c) that the detachment group and the compartmentalisation group would show differences in conceptual and perceptual priming levels.

The white-noise word identification task showed that those in the two dissociation conditions scored significantly lower than those in the neutral group. These results suggest participants in the two dissociation conditions took a shorter amount of time to identify the threat words in the task than the participants in the neutral group, indicative of greater levels of perceptual priming for the dissociation groups. Thus, results supported hypothesis (a).

Contrary to hypothesis (b), however, no significant differences were found between the combined experimental conditions and the neutral group for conceptual priming, as measured by the word-cue association task. The word cue association task in the current study suffered from low correct responses in the neutral category, which resulted in a floor effect, affecting the ability of the task to accurately identify differences in processing between groups.

Results also demonstrated a lack of support for hypothesis (c); no significant differences in perceptual or conceptual priming were found between the detachment group and the compartmentalisation group.

Further inspection of the results indicated a negative relationship between perceptual and conceptual priming, suggesting that those who had greater perceptual priming had lower conceptual priming, and vice versa. This supports previous research and theory suggesting both that processing forms are inversely related (Lyttle et al., 2010; Buck et al., 2009; Kindt et al., 2008). However, due to the small correlation in this study, this relationship may be more complex than originally thought. Being somewhat independent would help to explain why there was no significant difference found in conceptual priming between the dissociation and neutral groups; the heightened level of perceptual processing in the dissociation groups (as shown by the significant difference in

the white-noise word identification task) could have inhibited levels of conceptual processing in these participants, producing the non-significant results in the word cue association task. This could perhaps indicate that the current study was only able to affect a spectrum of perceptual processing, but not conceptual processing.

Irrespective of group, there were significantly more correct responses for the threat words than there were for the neutral words. This meant that individuals were more likely to give the correct target word for the threat words compared to the neutral words, indicative of greater levels of conceptual priming for threat words than for neutral words. This is unexpected, as the study by Lyttle and colleagues (2010) showed lower priming for specific troubles-related words (words associated with terrorism activity in Northern Ireland) compared to general threat-related words and neutral words. Therefore, more research is needed to address these contradictory findings. One reason for the apparent contradiction could be that these words were more psychologically pertinent to the participants, and therefore had a higher level of conceptual processing than the more neutral words from the neutral audio, but this still contradicts findings from other studies (Kindt et al., 2008; Buck et al., 2009).

Hypothesis Three: Intrusions

It was lastly hypothesised that those who experienced higher levels of perceptual priming and lower levels of conceptual priming (hypothesised to be in the two dissociation groups) would report higher levels of intrusions in the

intrusion diary. Intrusions were explored both in terms of overall number of intrusions, and their severity.

Severity of intrusions: Results showed that individuals in the combined dissociation groups reported significantly greater severity of intrusions than those in the neutral group. This is an interesting finding given that although many studies focus on frequency of intrusions (Holmes & Bourne, 2008), a study conducted by Michaels and colleagues (2005) found that severity of intrusions were a better predictor of PTSD than number of intrusions. Because levels of perceptual processing were found to be higher in the dissociation groups, this result supports the hypothesis that higher levels of perceptual processing would be related to higher levels of intrusions. The findings of the current study further add to the understanding of the mechanisms by which individuals develop PTSD by showing a link between peritraumatic dissociation and intrusion severity.

Frequency of intrusions: Contrary to predictions, perceptual and conceptual priming (white-noise and word-cue tasks) only accounted for less than 1% of the variance in the number of intrusions. In addition, no differences were found between the three conditions in terms of overall number of intrusions, nor for the number of intrusions for each day of the diary. Even when using a more sensitive measure of intrusions (by excluding those who experienced zero intrusions) no differences in frequency were found between groups.

Research has shown that intrusions are often visual in nature, which could explain the lack of intrusions found in our study, given that no visual representation of trauma was used. Ehlers and colleagues (2002) found that 97% of childhood sexual abuse survivors included visual phenomena in their

intrusive memories, indicating that intrusions have a strong visual element. The fact that numerous studies utilising the trauma film paradigm have been successful in eliciting more intrusions in experimental than control groups - whereas the current study was not - could indicate that distressing stimuli comprised of one perception modality (audio) does not cause as much distress as stimuli involving multiple modalities (films). However, results from the measures used in the current study (e.g. STAI-S) showed that the audio clips did indeed cause distress, particularly in the dissociation conditions. In addition, Krans and colleagues (2010) found that intrusions after listening to audio-only distressing stimuli were generally vivid and visual in nature.

The difference in the results produced by the frequency of intrusions compared to the severity of intrusions indicates that it would be useful to study more detailed reports of intrusions in future studies, rather than studying only the number of intrusions. For example, Michaels and colleagues (2005) also found that other intrusion factors that predicted the development of PTSD were their 'here and now' qualities and their lack of context. Future studies could include these measures in their intrusion diaries to give a more complete picture of intrusions and their causes or correlates.

As expected theoretically, the results showed that peritraumatic dissociation led to an increase in perceptual priming, and resulted in more severe intrusions. However, no differences were found in conceptual priming or in the overall number of intrusions between groups.

Methodological Limitations and Strengths

Self-report limitations may apply to measures used in this study, including the PDEQ – one of the pivotal measures of the study. This could lead to the problems associated with participants reporting higher levels of compliance because they are aware that compliance was expected of them. However, due to the subjective nature of dissociation, very few alternatives exist for the accurate assessment of dissociative symptoms and the PDEQ is still one of the most validated measures of dissociation (Marshall et al., 2002; Hooper, Dorahy, Blampeid, & Jordon, under review).

There were also a number of limitations relating to the sample used in the current study. One of these was the relatively high proportion of females (72%). This could have potentially created a bias within the groups, given that women are more likely to develop PTSD, even after controlling for the frequency and type of trauma experienced (Tolin & Foa, 2006). Tolin and Foa also found that women tended to rate the same traumatic events as more dangerous, negative and frightening than men, which could potentially mean that the average level of distress induced by the audio clips was higher than would be found in a population with a more equal gender split. Given that women have also been found to rely on counterproductive coping strategies post-trauma more frequently than men (Vingerhoets & Van Heck, 1990; Clohessy & Ehlers 1999), one could postulate that the current sample also experienced more severe or more frequent intrusions than might be expected in a more gender-balanced sample. In order to assess this possibility, gender differences on these variables were analysed. No significant differences were found in our sample, suggesting that the gender imbalance did not have a noticeable impact on our study. In

addition, the similar proportion of females within each experimental condition negates the potential for these biases to have affected between-groups comparisons.

The generalisability of the sample was also potentially limited by the fact that all participants were university students. Previous studies have shown that higher IQ and education act as protective factors in the development of PTSD and peri-traumatic dissociation (Brewin, Andrews & Valentine, 2000; Engelhard, Van den Hout, Kindt, Arntz & Schouten, 2003). It could be assumed that university students would have an average IQ and level of education higher than the general population; this would mean that one would expect the participants in the current study to present with less severe peritraumatic dissociation symptoms and fewer intrusions than the general population. This could account for the lack of differences found between the groups with regards to dissociative symptoms and number of intrusions in the current study, and highlights the need for a replication of this research with a sample more representative of the IQ and education level of the general population.

The compilation of valid and reliable word lists for the word-cue and white-noise tasks was somewhat hampered in the current study by the necessity that the words used also appeared in the audio clips. However, all attempts to match the words in relation to all relevant frequencies (e.g. in the clips and in general usage in the English language) were made. In addition, this method allowed for more valid method of priming – presenting the words *during* the distressing stimulus – somewhat counteracting the fact that it may not be as sensitive as the word tasks used in other studies, such as Lyttle and colleagues (2010). Although all possible steps were taken to match the words for the word-

cue association task across threat and neutral categories (including frequency in both the clips and the English language), unexpected biases still possibly remained. One example that arose during this study was with the cue word 'civil' (with the target word being 'engineer'). During the course of the study, a highly publicised government policy change occurred in New Zealand regarding civil union and gay marriage, which seemed to prime people away from the desired target word, and perhaps made the response 'union' more common than would normally be expected. In addition, the word-cue associations were taken from a British-English compendium, while the word frequencies were taken from an American-English compendium; it is possible that these may not be entirely accurate or valid for a New Zealand sample. Unfortunately, this was unavoidable, given that there is a lack of New Zealand language compendiums. This means that all word norms may be slightly misrepresented when using a New Zealand sample.

Certain limitations apply to all analogue trauma techniques, arising from their typical lack of severity in levels of distress experienced during the experiment compared to distress levels related to real-life traumatic events. Therefore, conclusions drawn from analogue trauma techniques are difficult to generalise to real life situations and PTSD development. This is especially the case in this study, where although the participants experienced changes in affect and increased anxiety during presentation of trauma, the distressing audio clip may not have been strong enough to elicit major levels of intrusions or distress. Previous studies have used real-life footage of the after effects of trauma, which may be more effective at creating distress than extracts of movies (Holmes & Bourne, 2008).

One final limitation arose from not testing the effect of each audio clip individually. Affectivity and anxiety were only assessed after both audio clips had been presented, and therefore it is impossible to definitively attribute the changes in affect to any one clip in particular. However, the self-report rating of distress level from each audio clip gives an indication of the impact of both, and the fact that participants rated the threat audio as significantly more distressing than the neutral audio does imply that the observed effects were due to the threat audio rather than the neutral audio.

The current study's utilisation of the trauma film paradigm allowed for the investigation of intrusions, cognitive processing and dissociation in an ethically sound way. No participants expressed distress during debriefing, nor in the weeks following the experiment, therefore it is thought that the study had no permanent effects on participants.

Although there were a small number of potential limitations associated with the current design and sample, many of these were controlled for during analysis. Overall, the study was well matched between the three conditions, with no differences found for any of the demographics, experimental controls and trait measures used in the current study. Therefore, any bias caused by age, gender, levels of trait anxiety (STAI-T) and trait dissociation (DSS) can be ruled out as a cause of the identified differences between the three groups. Responses to the ERQ questions were also not significantly different for any of the three conditions. In addition, participants reported that they were able to give reasonable attention to both the visual and audio elements of the study, with no differences in attention found between the three groups.

Another strength was the impact of the audio stimuli. It could be suggested that knowledge of the source of the audio in the current study, whether this was knowledge of the specific film that the clips came from, or merely that the clips were from a movie, could act to reduce the distress caused by the clip and allow psychological distancing from the content. Not only could this lead to desensitisation, but awareness of the source of the audio could also increase priming. Only approximately one third of all participants stated that they knew they were watching extracts of a movie, while less than 10% of all participants had seen the movies 'Chasing Amy' and/or 'Rendition' at the time of the experiment. This is a positive finding, as it suggests that the content should be non-familiar to most, avoiding problems with desensitisation and bias. There were no differences found between groups with regards to knowledge of the source of the audio clips.

Methodologically, the study further shows the potential of the audio-only version of the trauma film paradigm, as well as the white-noise task, and the potential of the manipulation of dissociation through visual tasks, especially the infrequently used mirror staring task.

Summary

The current study utilised new techniques in the analysis of PTSD and its origins, and showed their potential in the experimental study of dissociation and analogue trauma techniques. These techniques included the mirror-staring task for inducing dissociation, the white-noise task for assessing perceptual priming, and a confirmation of the potential of an audio-only version of the trauma film

paradigm. While the current study was not able to demonstrate significant differences between compartmentalisation and detachment groups with regards to dissociative symptoms and number of intrusions experienced, significant differences were found in the levels of perceptual priming and severity of intrusions between groups, and differences in responses to the PDEQ in the sample as a whole. Taken together, these findings supported the hypothesised role of differential processing as a cause of intrusions and other PTSD symptoms; the current study found that perceptual processing could increase levels of intrusions. The findings also contributed to the growing body of knowledge investigating the impact that cognitive processing has on the aetiology of PTSD, and the correlations between experiences at the time of trauma and the development of future mental health complications. While the current study was not able to demonstrate differential experimental manipulation of the type of dissociative symptoms experienced by participants, a number of promising directions and techniques for future studies in the area were highlighted.

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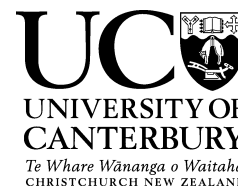
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Appendices

Appendix A: Human Ethics Approval



HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2012/158

7 November 2012

Rowan Peck
Department of Psychology
UNIVERSITY OF CANTERBURY

Dear Rowan

The Human Ethics Committee advises that your research proposal “Structural dissociation versus alterations in consciousness: priming and intrusion levels after listening to an anxiety-arousing auditory report” has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 6 November 2012.

Best wishes for your project.

Yours sincerely

A handwritten signature in black ink, appearing to read 'L. MacDonald'.

Lindsey MacDonald
Chair
University of Canterbury Human Ethics Committee

Appendix B: Demographic Questionnaire

Gender: Male ☐ Female ☐

Age: _____

Contact phone number: _____

Appendix C: Emotional Response Questionnaire (ERQ)

Please rate how you feel at this moment on the following scales:

1. Happy

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

2. Depressed

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

3. Angry

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

Appendix D: Dissociation Tension Scale (DSS)

Omitted due to copyright.

Appendix E: State Anxiety Inventory (STAI-S)

Omitted due to copyright.

Appendix F: Trait Anxiety Inventory (STAI-T)

Omitted due to copyright.

**Appendix G: Modified Peritraumatic Dissociative Experiences
Questionnaire (PDEQ)**

Omitted due to copyright.

Appendix H: Post Audio Measures of Commitment to Task

On the following scale please indicate the extent to which you found the interrogation audio clip distressing (circle the appropriate number):

Not at all distressing 0---1---2---3---4---5---6---7---8---9---10 *Extremely distressing*

On the following scale please indicate the extent to which you found the two authors audio clip distressing (circle the appropriate number):

Not at all distressing 0---1---2---3---4---5---6---7---8---9---10 *Extremely distressing*

On the following scale please indicate how much attention you were able to pay to the audio clips you just heard:

Not at all focused 0---1---2---3---4---5---6---7---8---9---10 *Attention completely focused*

On the following scale please indicate how much attention you were able to pay to the visual presentation you just saw:

Not at all focused 0---1---2---3---4---5---6---7---8---9---10 *Attention completely focused*

Appendix I: Follow-Up Questions

To what extent did you feel you were able to record all your intrusive memories in the diary:

0---1---2---3---4---5---6---7---8---9---10
Never remembered to *Always remembered to*
write down the intrusion *write down the intrusion*

At the time of the experiment, were you aware that you were listening to audio extracts of 2 movies?

Yes ☐ No ☐ Not sure ☐

At the time of the experiment have you ever watched the movie 'Chasing Amy'?

Yes ☐ No ☐ Not sure ☐

At the time of the experiment have you ever watched the movie 'Rendition'?

Yes ☐ No ☐ Not Sure ☐

Appendix J: Word Lists for Word-Cue Association Task

Word List for Word-Cue Association Task.

Word Category	Target Word	Cue Word
Threat	Mistake	Accidentally
	Phone	Call
	Egypt	Crypt
	Lawyer	Legal
	Engineer	Civil
	Criminal	Conviction
	Lying	Cheat
	Language	Accent
Neutral	Draw	Circumscribe
	Characters	Shady
	Depth	Fathoms
	Station	Bus
	Audience	Captive
	Cartoon	Peanuts
	Friends	Girl
	Ink	Invisible

Appendix K: Word Lists for White-Noise Task

Word List for White-Noise Masked Word Identification Task

Word Category	Target Word
Threat	Terror Attack Numbers Chemical Bomb Explosive Deadly Confession
Neutral	Thousand Colourist Pictures Tracing Book Darts Painting Commercial

Appendix L: Intrusion Diary

Over the next 3 days please take the time to fill out the following intrusion diary (starting as soon as you leave today).

Intrusions are any thoughts/memories/images about the clips occurring when you had not intended to think about the audio.

Each time this happens please note the time that it occurred, rate the level of distress and briefly describe its contents in the following table:

	Date and Time	How distressing was it? 0-----10 Not Extremely	Description of its contents
Day 1			
Day 2			
Day 3			

Appendix M: Information Form**Department of Psychology**

Primary Researcher Tel: 021 257 9486

Email: rowan.peck@pg.canterbury.ac.nz

3/10/2012

Information Processing for Emotional Information: the Impact of Dissociation

This is a Masters research project looking at how people's memory can change depending on the level of perceived anxiety of an event, and what underlying mechanisms may contribute to these phenomena.

Your involvement in this project will be to fill in 3 short questionnaires (about your mood and feelings over the past week), then listen to two audio clips whilst concurrently performing an attention task. These clips may activate different feelings inside you, like anxiety, calmness, concern and warmth. Following this you will complete another short questionnaire and two auditory tasks. As a follow-up to this investigation, you will be asked to return to the lab for a short debrief three days later. On the days between coming into the lab, you will be asked to record any thoughts related to the audio clips in a provided diary.

The initial stage of the experiment will take approximately 45 minutes to complete and the follow up will take approximately 10 minutes. The diary will take less than 5 minutes to complete per day.

In the performance of the tasks and application of the procedures there are risks of one of the scenarios being potentially upsetting for some people. If you find that anything involved in this study causes you to feel distressed, you are more than welcome to discuss this with the researcher at the time, during the de-briefing at the end of the study or at some later point.

You may receive a copy of the project results by contacting the researcher at the conclusion of the project. Participation is voluntary and you have the right to withdraw at any stage without penalty. If you withdraw, I will remove information relating to you (until the point at which the data has been analysed).

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: your identity will not be made public without your prior consent. To ensure anonymity and confidentiality, your name or identifying information will not go on any of the material. Data will be stored in a locked filing cabinet and only the primary researcher will have access to raw data. A thesis is a public document and will be available through the UC Library.

The project is being carried out as a requirement for a Master of Science thesis by Rowan Peck under the supervision of Associate Professor Martin Dorahy, who can be contacted at rowan.peck@pg.canterbury.ac.nz. He will be pleased to discuss any concerns you may have about participation in the project.

For your participation in this experiment you will receive a \$10 voucher at the follow up, and go into the draw to win a \$50 voucher.

We are looking to recruit university students, so those on the STAR program are excluded from the study.

This project has been reviewed and approved by the University of Canterbury Human Ethics Committee, and participants should address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

If you agree to participate in the study, you are asked to complete the consent form and return to the primary researcher.

Rowan Peck (M.Sc. thesis student)

Martin Dorahy (supervisor)

Appendix N: Consent Form

Department of Psychology
Primary Researcher Tel: 021 257 9486
Email: rowan.peck@pg.canterbury.ac.nz
3/10/2012



Information Processing for Emotional Information: the Impact of Dissociation

I have been given a full explanation of this project and have had the opportunity to ask questions. I understand what is required of me if I agree to take part in the research.

I understand that participation is voluntary and I may withdraw at any time without penalty. Withdrawal of participation will also include the withdrawal of any information I have provided should this remain practically achievable.

I understand that any information or opinions I provide will be kept confidential to the primary researcher, and that any published or reported results will not identify the participants. I understand that a thesis is a public document and will be available through the UC Library.

I understand that all data collected for the study will be kept in locked and secure facilities and/or in password protected electronic form and will be destroyed after five years.

I understand the risks associated with taking part and how they will be managed.

I understand that I am able to receive a report on the findings of the study by contacting the researcher at the conclusion of the project.

I understand that I can contact the researcher- Rowan Peck (email: rowan.peck@pg.canterbury.ac.nz; or tel: 021 257 9486) or supervisor Assoc. Prof. Martin Dorahy (tel: +64 3 364 3416) for further information. If I have any complaints, I can contact the Chair of the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch (human- ethics@canterbury.ac.nz).

By signing below, I agree to participate in this research project.

Name: _____

Signature: _____ Date: _____

Rowan Peck (primary researcher)

Martin Dorahy (supervisor)

Appendix O: Debrief Form**Participant Debriefing Form**

It is important for us to get feedback on your experience as a participant in this psychology experiment. Doing so helps us to better understand your perspective and enables us to provide a better experience in the future as well as helping us to minimise or eliminate the potential for participants to feel uncomfortable or distressed. We will work through each question together.

Debrief on the details of the study

The study that you have just taken part in was designed to further our understanding of the role of different types of dissociation in the development of Post-traumatic Stress Disorder (PTSD). Dissociation (or more specifically – peritraumatic dissociation) is the term used to describe a set of commonly experienced psychological phenomena that are characterised by alterations in one’s sense of self and the world around them. Dissociative symptoms are widely accepted to be one of the contributing factors that predicts whether a person will later develop PTSD after experiencing a traumatic event.

In this study we were exploring two proposed forms of dissociation (through either a mirror-staring task or a dot-staring task presented during the auditory stimuli) and comparing their role in subsequent intrusions (the diary). The word-cue and word-distortion memory tasks also allowed us to investigate the link between cognitive processing of distressing experiences and subsequent levels of intrusions.

The audio clips used in this study were fictitious and were composed for the purpose of the study from two movies (Rendition, 2007 and Chasing Amy, 1997). One clip was designed to induce a sense of anxiety to the listener and the other was used as a neutral control. Participants were not told that the audio clips were from movies at the start of the study, as this would have reduced the impact and the perceived feelings evoked by the clips. If you feel uncomfortable with this, you still have the option to withdraw your data from the sample. Additionally, it is important to note that all of your results are confidential, that there is no way to identify your results from the others, and that your data will only be used and published as part of group data.

Considering the purpose of the study:

How are you feeling about taking part in the study?

Was there anything that you found interesting about the study?

Was there anything that you found distressing about the study?

Do you have any questions regarding the study or anything that you would like to discuss with me?

Further Information

If you are interested in learning more about this topic, you may be interested in reading these book chapters and articles, which are available through the central library or online through the database PsycINFO.

Kindt, M., Van den Hout, M., Arntz, A. and Drost, J. (2008). The influence of data-driven versus conceptually-driven processing on the development of PTSD like symptoms. *Journal of Behavior Therapy and Experimental Psychiatry*, 39, 54-57.

Lyttle, N., Dorahy, M., Hanna, D., & Huntjens, R. J.C. (2010). Conceptual and Perceptual priming and dissociation in chronic Posttraumatic Stress Disorder. *Journal of Abnormal Psychology*, 119 (4), 777-790.

Steele, K., Dorahy, M. J., Van der Hart, O., & Nijenhuis, E. R. S. (2009). Dissociation versus alterations in consciousness: related but different concepts. In P. F. Dell & J. A. O'Neil (Eds.), *Dissociation and the Dissociative Disorders: DSM-V and Beyond*. New York: Routledge.

Thank you for your participation in this study; your input is very much appreciated by the research team. If you are interested in obtaining a copy of the research when it is completed, please feel free to contact the primary researcher.

Appendix P: Introduction to Audio Text

You are about to hear two short audio clips - both around 7mins in length – consisting of two scenarios. These will be presented in random order, with a short break between the presentations:

One audio is the reenactment of true events involving a man who was wrongly arrested and interrogated in relation to an explosion that took place in a busy city street, killing dozens of civilians. Throughout the clip you will hear the various torture methods that were used on the victim.

The other clip follows the personal life of an up and coming artist who is trying to promote his new material. Throughout the clip you will hear about the evolution of his friendships and his attempts to balance his personal relationships.

As well as listening to the audio, please focus as much as possible on the visual presentation that is in front of you for the entirety of the experiment.

Appendix Q: White Noise Task Scores for Neutral Words

White-Noise task scores for neutral words, by group.

	Neutral Group	Spinning-dot Group	Mirror Group
N	20	19	21
Mean Sum	152.15	143.79	145.67
Median Sum	151.00	144.00	148.00
Std. Dev.	15.74	17.63	17.39
Minimum	117	97	115
Maximum	183	168	178