When the bells go down:

Resilience and vulnerability in firefighters

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Abstract

Firefighters respond to a wide range of critical incidents in which they face exposure to multiple stressors. Previous studies have reported prevalence rates of various symptomatology and identified some risk factors for firefighters, but accord has not been reached across studies on the extent of vulnerability or resilience and potential predictors of each have not all been identified. Studies with firefighters in the United Kingdom are comparatively rare. The purpose of this series of studies was, therefore, to investigate the prevalence of PTSD symptomatology and that of its associated comorbid conditions (depression, anxiety and alcohol misuse) in UK firefighters. On the basis of a literature review, the role of thought control, counterfactual thinking and humour style in predicting symptoms was examined.

Study I examined this together with the demographic, occupational, event-specific and cognitive factors associated with these conditions in a retrospective, cross-sectional analysis of multiple exposure in firefighters. Results indicated that these firefireghters demonstrated high levels of resilience, recording relatively low rates of PTSD, depression, anxiety and alcohol misuse symptomatology. No *DSM-IV* Criterion A1 exposure variable independently predicted symptomatology of PTSD, but A2 responses of fear and helplessness predicted PTSD symptomatology, and A2 fear predicted alcohol misuse. Individual aspects of A1 exposure did predict symptomatology of depression, anxiety and alcohol misuse; one operating schedule predicted symptomatology of depression and anxiety; and both previous divorce and previous psychiatric diagnosis predicted symptomatology of alcohol misuse. Of the three cognitive predictors, nonreferent counterfactual thinking and self-defeating humour independently predicted higher levels of PTSD symptomatology, whilst self-enhancing humour predicted lower symptomatology of depression. Results were essentially the same in both regression models, indicating no difference between the predictive power of these cognitive constructs between the models where humour was used at work and when used with the person closest to the participant.

Study 2 evaluated the same symptomatology in a longitudinal investigation of firefighters exposed to a single critical incident in which the casualty's life could not be saved, again addressing the cognitive factors of thought control strategies, counterfactual thinking and humour style. Results showed high levels of resilience with firefighters recording relatively low rates of PTSD, depression, anxiety and alcohol misuse symptomatology, although symptomatology of depression, anxiety and alcohol misuse increased over time for a small number. Factors associated with development of symptomatology were firefighter type and rank, A2 horror, body recovery, and the use of thought

suppression and “if only” counterfactuals). However, these were not long-lasting. Similarly, associations between depression/anxiety symptomatology and A2 helplessness; anxiety and previous psychiatric diagnosis also had a short term effect on symptoms. Those who were younger and who had not been involved in body handling had higher depression scores at T2 although the sample size was small and these results may be anomalies.

Study 3 explored the firefighters’ responses to the same critical incident in greater depth in order to draw out any aspects of it which caused distress and any factors which were found to be helpful in coping with such distress. This qualitative exploration was designed to identify the meaning attached to aspects of critical incidents and how firefighters individually experienced such a critical incident response in comparison with other critical incidents. Results showed positive emotions, professional pride and a strong sense of duty were expressed far more than “negative” emotions, suggesting a high degree of resilience. Identification with the dying or dead is a marker for distress because meaning has been attributed to the event through recognition of the deceased’s humanity. Dissonance arose because of the struggle between this recognition and the desire to protect colleagues and it appears that it is this dissonance which adversely affects those with responsibility for making decisions. Feelings of helplessness arose through operational limitations and are also a marker for distress. Avoidance techniques were utilised, but thought suppression was not identified as such, although the transposition of distressing images through humour was reported. Downward counterfactuals were reported more frequently than upward, and the latter related to decision making and operational difficulties. The type of humour commonly used is banter which includes “taking the piss” out of colleagues and situations although it was not experienced the same way by all firefighters. The purpose of banter is to cope with the stressors inherent in the job of firefighting and to facilitate bonding through its use as a private language. This study identified three “rules of banter”: it is reciprocal, the timing of it is critical, and it has contextual restrictions. Adaptive banter may be expressed as the self-enhancing or affiliative styles of humour and maladaptive as self-defeating, or banter may itself be a separate style of humour.

Together, the studies’ findings show that these firefighters were resilient to exposure to a range of stressors but that suffering may be seen on a spectrum. This has implications for theory and further research, and for the development of psychoeducational interventions to increase resilience in those first responders who may be at risk of developing symptoms.

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The firefighters agreed to give up their time and take part in this study simply because they hoped that in doing so, they would help other firefighters. They received no reward or compensation for their time and diligence. I very much hope we succeeded in achieving this aim and insofar as we did, it is down to them. I have the utmost admiration for the firefighters' pride in their work, comradeship, openness, irrepressible humour and sheer guts.

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Resilience and vulnerability in firefighters

"Danger invites rescue. The cry of distress is the summons to relief … The wrong that imperils life is a wrong to the imperiled victim; it is a wrong also to his rescuer."

Wagner v. International Ry. Co. (1921)

Captain Randall U. Mottram, a firefighter/paramedic serving with the Fairfax County Fire & Rescue Department, responded to a house fire on March 10, 1996. What happened during and after that fire is reported by Lindahl (2004) and *Fairfax County Fire & Rescue Department v. Mottram (*2002). To summarize those reports, the five year old girl to whom Capt. Mottram was tending during the response asked him about her stepmother whom he knew to be dead, and he also knew that her father had been seriously injured. He was reminded of another fire to which he had responded in which children had died with other family members. During his nineteen years of service, Capt. Mottram had been exposed to multiple critical incidents, and he had been experiencing some symptomatology prior to this incident, but after it, his condition deteriorated and by December 1996, he had been admitted to hospital. Amongst the symptomatology he suffered, Capt. Mottram "reported symptoms of terrifying intrusive thoughts, exaggerated startle response, and memories of emergency calls going back throughout his career, triggered by such stimuli as the sound of sirens or certain smells …" (Lindhal, 2004, p 544).

The development of this study, and the research on which it was based, can be illustrated by the experience of Capt. Mottram, whose struggle to obtain recognition of, and compensation for, his posttraumatic stress disorder (PTSD) finally ended in the Supreme Court of Virginia, which held that his PTSD was an occupational disease entitling him to compensation.

Chapter 1 : Posttraumatic stress disorder

1.0 Introduction

This thesis investigates vulnerability and resilience to posttraumatic distress in a sample of UK firefighters. By its nature, firefighting involves exposure to dangerous and potentially traumatic situations and it is important to understand whether such exposure, or aspects of it, cause distress. Such potential distress may be great enough technically to meet criteria for the presence of a psychiatric disorder, although results will not indicate a diagnosis, merely a level of distress.

As was the case with Capt. Mottram, of all the psychiatric disorders recognised by the American Psychiatric Association, the most obvious suspect following exposure to a "traumatic event" is Posttraumatic Stress Disorder ("PTSD") because it is one of the rare disorders recognised whose definition includes an essential causative event (Friedman, 2011). The Diagnostic and Statistical Manual of Mental Disorders in which the definition of the disorder is contained is revised at intervals, and at the time of commencement of this study, was DSM-IV-TR, (APA, 2000). Since the commencement of this study, DSM-5 (APA, 2013) has been published. The World Health Organisation also recognizes and defines PTSD, publishing the International Classification of Mental and Behavioural Disorders (World Health Organisation, 1992), currently at version ICD-10.

This study examines the prevalence of PTSD and its associated comorbid conditions in UK firefighters, together with the demographic, occupational, event-specific and cognitive factors associated with these conditions. The structure of the thesis is as follows:

Chapter 1 describes the development, diagnosis and models of PTSD.

Chapter 2 reviews the evidence for the prevalence of PTSD as well as factors that predict its development. This is done firstly in the general population and then repeated for firefighters and other emergency personnel. This contrasts factors of aetiological importance in those exposed to potentially traumatic events in their working lives with those events experienced by members of the public as a result of random exposure, through assault, accident or disaster.

Chapter 3 reviews the evidence for three constructs, thought control, counterfactual thinking and the use of humour, that encapsulate many of the predictors identified in Chapter 2 but for which there is relatively little direct evidence in the firefighter population. It is the integration of those factors that is one of the unique contributions of this thesis.

Chapter 4 describes the Methods used in this thesis, justifies the mixed methods approach and identifies the unique and overlapping features of each of the three parts of the study.

Chapters 5, 6 and 7 describe the results of these investigations in which thought control, counterfactual thinking and use of humour are explored in firefighters. Chapter 5 does this through a reasonably large and representative sample of UK firefighters exposed to a range of potentially traumatic events. Chapter 6 describes a longitudinal investigation on the same issues in relation to a unique and potentially highly distressing critical incident (CI) experienced by 27 firefighters. This CI is explored further in a retrospective investigation in which these firefighters were interviewed or took part in focus groups.

Chapter 8 is a Discussion in which the results of the three investigations are integrated and their implications considered. Directions for future research, including the development of interventions, are identified.

To conclude, this thesis examines three cognitive constructs as its primary focus, together with other relevant potential predictors of psychopathological responses in firefighters in the context of both overall occupational exposure, and exposure to one particularly harrowing incident.

This examination commences with a description of PTSD.

1.1 The diagnosis of Posttraumatic stress disorder

The birth of PTSD as a "mental disorder" (DSM-5, APA, 2013) represents the culmination of a trail which began with distress, meandered through railways and theatres of war, and ended up in the arms of psychiatric nosology.

The PTSD label is relatively new, but by the 19th century, some forms of psychic distress following on from traumatic events had been recorded (Young, 1995; Brewin, 2003). For Pierre Janet, an inherent weakness in some people led to their dissociative responses to traumatic events, causing a loss of memory (Brewin, 2003), a theory which has been evidenced in part since peritraumatic dissociation is a strong predictor of PTSD (e.g. Ozer et al., 2003) and dissociative amnesia has been found to be a predictor (Bryant et al., 2011). Modern day theories, such as dual representation theory (Brewin, Dalgleish & Joseph, 1996; Brewin et al., 2010) continue to place memory at the heart of PTSD. Although the basis for the symptomatology was considered by many to be organic, recognition of an emotional or psychological basis grew. For example, "railway spine" (psychological symptomatology in the absence of apparent physical injury), was considered by Page to be "general nervous shock" caused by "extreme fright" (Brewin, 2003, p. 26) and soldiers not in the vicinity of an explosion were also found to suffer from symptomatology of "shell shock" during the First World War (Brewin, 2003). By the end of the First World War, Young (1995, p.41) reports that there were tens of thousands of victims of shell shock treated and "It was as if a hundred colossal railway smashups were taking place every day, for four years.".

As reported by Jones & Wessely (2005, pp. 1-5), many terms have described psychiatric symptoms related to combat including cerebro-spinal shock, wind contusions, nostalgia, melancholia, disordered action of the heart and combat stress reaction. In World War II, symptomatology was described variously as "traumatic war neurosis, combat fatigue, battle stress and gross stress reaction" (Andreasen, 2010, p.67). "Gross stress reaction" appeared in the first edition of the Diagnostic & Statistical Manual of Mental Disorders (DSM-I; APA, 1952), but was "eliminated from DSM-II for reasons that are unclear, leaving no category for pathological responses to trauma" (Spitzer, First & Wakefield, 2007, p.234). Andreason (2010, p.68) suggests that the "most plausible explanation for the omission is that the concept was closely linked to warfare and combat, and DSM-II was written in a peaceful era."

The terminology "Posttraumatic Stress Disorder" was first introduced in the DSM-III (APA, 1980). Criterion A required the "Existence of a recognizable stressor that would evoke significant symptoms of distress in almost everyone". The accompanying text referred to "… a psychologically traumatic

event that is generally outside the range of usual human experience" (Weathers & Keane, 2007, p.108). The definition in DSM-III-R (APA, 1987) differed in several respects (see Weathers & Keane, 2007 for review), but Criterion A required that "The person has experienced an event that is outside the range of usual human experience and that would be markedly distressing to almost anyone" (APA, 1987) and gave examples of such events. As Weathers & Keane (2007) note, within the text, the emotional responses of intense fear, terror and helplessness are included, as is indirect exposure, which involves learning about an event at which one was not present. And so, the recognition of a psychological response to experiencing a severe life-threatening event, which would be outside the range of most people, became something which a person could develop whilst not being in the vicinity of the event.

1.2 The definition of PTSD current at the time of the study: DSM-IV-TR (APA, 2000)

1.2.1 Criteria

The next revision, DSM-IV (APA, 1994) required in Criterion A that the person had been exposed to a traumatic event in which "the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others" and a response of "intense fear, helplessness or horror" (APA, 1994, pp. 427-428). An A1 event alone is insufficient as an A2 emotional response is required, hence A1 events may be referred to as "potentially traumatic events" [PTEs] and those A1 events which also meet A2 criteria may be referred to as "traumatic events" [TEs] (Weathers & Keane, 2007, p. 111). DSM-IV retained the "learning about" events. Minor revision of the DSM in 2000 did not change the language of Criterion A from DSM-IV, (DSM-IV-TR (APA, 2000), although the DSM-5 (APA, 2013) changed it significantly.

Criterion B (APA, 1994) describes the core re-experiencing symptomatology (Ehlers & Steil, 1995) of PTSD, which includes intrusions, dreams and flashbacks and psychological responses to reminders of the event (APA, 1994). If the meaning of these intrusions is negatively interpreted, attempts may be made to control them, which maintains them (Ehlers & Clark, 2000; Steil & Ehlers, 2000). Although involuntary intrusions are symptoms of PTSD, they arise in other disorders, for example in depression (e.g. Brewin, 2003; Reynolds & Brewin, 1998) and obsessive compulsive disorder (e.g. Lipinski & Pope, 1994). They may differ in context (Sasson et al., 2005; Lipinski & Pope, 1994)

Intrusions described as flashbacks are intrusive, involuntary "images and sensations [which] are typically disjointed and fragmentary" and appear "like slides that are suddenly flashed up on a screen by an unpredictable projectionist" (Brewin 2003, p.100). Some may be mild and brief and others more severe (Brewin, 2011). "Specific parts of the trauma memory that cause highest levels of emotional distress" are termed hotspots (Holmes, Grey & Young, 2005, p.5; Grey & Holmes, 2008). Nightmares concerning the traumatic event and flashbacks feature distinctively in this disorder (Brewin et al., 2009). Brewin (2003) differentiates between intrusive memories and flashbacks in that the latter rarely feature in other disorders, citing Kilpatrick et al., 1998; Reynolds & Brewin, 1998) and are an element of PTSD differentiating it from other disorders and from having no disorder (Bryant et al., 2011).

Criterion C (APA, 1994) represents symptomatology of avoidance and numbing and Criterion D covers symptomatology of arousal (APA, 1994). The cognitive model of PTSD (Ehlers & Clark, 2000) describes how attempts to avoid reminders or cues and attempting to control thoughts and feelings are dysfunctional because they maintain the symptomatology they are designed to control (see further below). To fulfil the DSM-IV criteria, Criterion E requires that the symptomatology must persist for more than a month and Criterion F that distress or impairment is caused as a result of the symptomatology (APA, 1994).

1.2.2 Clusters of symptomatology

Analysis has confirmed that there are clusters which correspond with the PTSD DSM-IV structure, but the number of clusters differs, for example two clusters (Kilpatrick et al., 1998) and three (Foa, Riggs & Gershuny, 1995; Del Vecchio et al., 2011). In addition to the three clusters, Del Vecchio et al., (2011) identified three subdomains of depersonalisation, guilt and sexual problems which were not in the DSM-IV criteria. Four clusters are needed because deliberate avoidance and numbing "do not tend to occur together and are probably explained by different mechanisms" (Brewin, 2003, p. 38), and four clusters have been identified in a number of studies (Amdur & Liberzon, 2001; Carragher, et al., 2010; Simms et al., 2002; Costa et al., 2011; Andrews, Joseph, Shevlin & Troop, 2006). The criteria for DSM-5 PTSD is set out in four symptom clusters comprising intrusions, avoidance, negative alterations in cognitions and mood, and alterations in arousal and reactivity (APA, 2013).

1.2.3 The causative lynchpin problem

Criterion A1 is the central, causative element of PTSD. This causative lynchpin is described as "scientifically and clinically dubious" (Summerfield, 2001, p. 97). Criticism has been made that the A1 stressor is too wide (e.g. Spitzer, First & Wakefield, 2007), and leads to "conceptual bracket creep" (McNally, 2003**,** p. 231) because one does not have to present at the actual event, but just learn of it. The "learning about" events in the text relate to unexpected or violent death or injury, actual or threatened, to a loved one (see Weathers & Keane, 2007, p.110). These five events increased the number of qualifying A1 events by 59.2%, although with A2 included, the increase is 22% (Breslau & Kessler, 2001). The learning about events are less likely to lead to PTSD than the previous DSM qualifying events (Breslau & Kessler, 2001) and symptomatology did not last for as long (Breslau et al., 1998). Weathers & Keane (2007) state that the five learning about events included in Breslau & Kessler's (2001) findings would have met DSM-III-R criteria (if the text is considered) and DSM-IV did not therefore expand the definition. Brewin et al., (2009, p. 368) comment that learning of the sudden unexpected death of a loved one "could quite reasonably be described as traumatic", and indeed so, but perhaps the criticism of A1 as too broad is fair, as enunciated by McNally (2009, p.598): "If nearly everything can count as trauma, then the term morphs into a trope for misfortune in contemporary life and loses whatever meaning it originally had."

Casting further doubt on the causative link, studies have found that PTSD symptomatology can arise in the absence of an A1 event, for example, the death of cattle as a result of disease (Olff et al., 2005). Non-A1 events have been associated with an equal or greater likelihood of probable PTSD diagnosis and symptom frequency/severity than have those meeting the criteria (Long et al. 2008; Gold et al., 2005; Van Hooff et al., 2009; Bodkin et al., 2007). When using different methodology to Gold et al., (2005), A1 and A2 events resulted in more symptomatology than in non-A events (Boals & Schuettler, 2009), and fewer diagnoses resulted from non-A than A events with no significant differences in severity of symptomatology (Cameron, Palm & Follette, 2010). Complete removal of Criterion A1 has been advocated (Neilssen & Large; 2011; Maier, 2007; Brewin, 2009) as have changes in wording (McNally, 2009; Spitzer, First & Wakefield (2007). Weathers & Keane (2007) asserted that removal of Criterion A risked "trivializing the suffering of those exposed to catastrophic events" (p.114). Arguably, this has already been achieved. McNally (2009) cites "a distinguished historian of military psychiatry" (Shepherd, 2004, p.57) commenting, ''Any unit of classification that simultaneously encompasses the experience of surviving Auschwitz and that of being told rude jokes at work, must, by any reasonable lay standard, be a nonsense, a patent absurdity'' (McNally, 2009, p.598). Maier (2007) has, however, argued that "the *DSM* is not aiming to find out what a trauma is,

but what a posttraumatic stress disorder is" (p.915), observing "in clinical practice the diagnosis is long ago easily and reliably established on the sole basis of the Criteria B-F" (p. 916). This is supported by the 90% PTSD prediction efficiency of the Trauma Screening Questionnaire in which participants can "endorse any combination of six or more re-experiencing and arousal symptoms" (Brewin et al., (2002, p. 160).

Most studies which use self-report measures do not include both A1 and A2 evaluation (Del Ben et al., 2006). The reasoning behind its inclusion in DSM-IV was that it should act as a "gatekeeper" as the field trials had shown that those exposed to non-A1 events would not usually have the subjective A2 response (Friedman, 2011, p. 8). Breslau & Kessler (2001) and Creamer, McFarlane & Burgess (2005) both reported that 76% of traumatic events involved A2 reactions, with females more likely than males to do so. Out of 6104 trauma exposed people, only 4 developed PTSD without A2 fear or helplessness, although horror was not measured (Creamer, McFarlane & Burgess, 2005) and those people who developed PTSD were more likely to report intense experience of the A2 emotions (Brewin, Andrews & Rose, 2000), but no difference was found in persistence of PTSD whether A2 was present or not (Karam et al., 2010). The absence of A2 emotions, however, predicted the absence of PTSD (Breslau & Kessler, 2001; Bedard-Gilligan & Zoellner, 2008). The restriction in the A2 criterion to three emotions excludes others emotions associated with PTSD, such as anger, disgust and sadness experienced at the same level of severity as fear (Hathaway, Boals & Banks, 2010) and anger and shame both predicted PTSD symptoms (Brewin, Andrews & Rose, 2000; Andrews, Brewin, Rose & Kirk, 2000). Further PTSD patients without an A2 response either experienced distress, or A2 at lower levels of intensity, or were amnesic (O'Donnell et al., 2010).

Recommendations for the removal of A2 (e.g. McNally, 2009; Karam et al., 2010) are now arguably moot because DSM-5 (APA, 2013) removed Criterion A2 from the definition of PTSD, but inserted fear and horror (alongside anger, guilt or shame) as examples of "persistent negative emotional state" in the Criterion D (APA, 2013, p. 272). However, DSM-5 does not specifically mention helplessness in D4 which "may be as or more important in the genesis of PTSD as fear" (Brewin, Andrews & Rose, 2000, p. 507). Analysis of associations between A2 and other emotional responses seems still to be warranted in first responders firstly because combat veterans were the least likely to report A2 responses (Breslau & Kessler, 2001; Creamer, McFarlane & Burgess, 2005) and yet combat exposure is one of the traumatic events most commonly associated with PTSD (Kessler et al., 1995) and first responders are also multiply exposed to PTEs. Secondly, the assessment of A2 has

been found to be important in the firefighter literature in assessing PTSD prevalence (Del Ben et al., 2006).

1.3 Models of PTSD

1.3.1 Summary of models

Theoretical models of PTSD have much in common with historical diagnostic labels in their diversity. Brewin & Holmes (2003) categorised them into "early theories" (pp.346-352) including stress response (Horowitz, 1976) and shattered assumptions (Janoff-Bulman, 1992); and "recent theories" (pp. 352 – 365) which include emotional processing (Foa & Riggs, 1993; Foa & Rothbaum 1998); dual representation theory (Brewin, Dalgleish & Joseph, 1996; Brewin, 2001; Brewin et al., (2010); and the cognitive model (Ehlers & Clark, 2000). Other models include the metacognitive model (Wells, 2000, Roussis & Wells, 2006) and the SPAARS model, (Dalgleish, 1999, 2004; Power & Dalgleish 1997; 1999; Dalgleish & Power, 2004).

The three "main clinical theories of PTSD" are emotional processing, dual representation theory and the cognitive theory (Brewin, 2011, p.220) which Brewin & Holmes (2003) reviewed in detail. To summarise their review briefly, emotional processing theory (Foa & Riggs, 1993; Foa & Rothbaum 1998) builds upon the fear network approach (Foa et al., 1989) and proposes that concepts of safety and personal competence are violated or confirmed by the traumatic event, and is also concerned with negative appraisals of pre-trauma and post-trauma responses and behaviour. Prolonged exposure, the treatment associated with this theory, seeks, amongst other things, to reduce anxiety, integrate the trauma memory, and re-evaluate negative appraisals. The second theory is dual representation theory (Brewin, Dalgleish & Joseph, 1996; Brewin et al., 2010) which holds that two memory systems are in operation, one being the verbally accessible (VAM) system and the other the situationally accessible (SAM) system. In his explanation of dual representation theory, Brewin (2003) states that VAM trauma memories are retrievable consciously, being integrated in long-term memory, but flashbacks, which are not voluntarily accessible, are operations of the SAM system, which contains information about the traumatic event which was not attended to consciously, such as things seen or heard and information about the physiological response at the time (Brewin, 2003). The third is the cognitive model of Ehlers & Clark, (2000). This holds that the unusual element of PTSD, differentiating it from other anxiety disorders, is that the response arises not through appraisal of future threat, but through memory of an event in the past (Ehlers & Clark, 2000). Their model thus proposes that the sense of current threat which is experienced arises through negative appraisal of the event itself and its aftermath, and through the nature of the trauma memory. Current threat is sensed through the experience of intrusions, symptoms of arousal and strong

emotions, which lead to the implementation of maladaptive coping/response strategies designed to control them.

1.3.2 Models informing this programme of research

This research takes as its foundation the cognitive model of PTSD focusing on the negative appraisal of the event and its aftermath (Ehlers & Clark, 2000). It also invokes the appraisal model by which primary appraisal of a PTE determines how the stressor is perceived, while secondary appraisal determines the survivor's perception of the adequacy of available coping resources (Lazarus & Folkman, 1984). Dalgleish & Power (2004) proposed a framework incorporating emotions other than fear in the appraisal element of PTSD based on their SPAARS model (Dalgleish, 1999, 2004; Power & Dalgleish 1997; 1999). This holds that PTEs become TEs because they incorporate discrepancies from pre-existing schemas regarding the self and the world, as does Janoff-Bulman (1992), which cause "intense fear or distress via either an 'automatic' or an 'appraisal-driven route' or both (Power & Dalgleish, 1997)" (Dalgleish & Power, 2004, p. 1071). Attempts to resolve the discrepancy ensure that the event remains alive and so is re-experienced. According to this framework, the discrepancy itself is also appraised, "leading to what we call 'existential emotions' (Dalgleish, 2004) such as helplessness and horror" (p. 1071). Dalgleish & Power (2004) thus propose an emotion-non-specific component of the disorder, which is that attempted resolution of the discrepancy leads to the re-experiencing symptoms which themselves generate distress and lead to the avoidance symptoms, and that the appraisal of this discrepancy leads to existential emotions, regardless of which emotions are invoked by the TE itself.

This proposal accommodates to an extent the concept of the meaning of the PTE to the individual. Gordon Turnbull describes the intense emotional response to an A1 event as "demonstrating that it had 'pierced' or 'penetrated' the individual's psychological defences" (Turnbull, 2011, p. 297), explaining that it is the meaning an individual ascribes to the PTE which determines whether or not they develop symptomatology, and this is to be explored in this programme of research. A similar concept was described by Paton & Smith (1996) in the context of work-related trauma such as that experienced by first responders. The ecosystemic model (Peterson et al., 1991) they used is a synthesis of appraisal elements and includes a central element of cognitive processing which determines "whether adaptive processes facilitated positive or pathological resolution" (Paton & Smith, p.22). The elements of the model are thus "appraisal and meaning, experience, individual characteristics, and the recovery context' (Paton & Smith, 1996, p.22).

Therefore, the research direction is informed by the cognitive theories incorporating A2 and other emotional responses evoked by the appraisal of the TE or its aftermath, which is, in turn, influenced by the meaning the exposed individual attributes to the traumatic stressor.

1.4 Controversy and conclusion

"Since its introduction into DSM-III in 1980, no other DSM diagnosis, with the exception of Dissociative Identity Disorder (a related disorder), has generated so much controversy in the field as to the boundaries of the disorder, diagnostic criteria, central assumptions, clinical utility, and prevalence in various populations"(Spitzer, First & Wakefield, 2007, p. 233). This is not merely of academic concern, but is also of sociological, clinical and legal significance. Fundamental criticisms are that it is an invention or social construct, that it pathologizes normal human responses, and that it is not a discrete disorder (see Brewin, 2003, pp. 23- 43 and Summerfield, 2001). The purpose of this research is not to investigate whether or not PTSD is an invention, but is concerned with the other two criticisms. If PTSD as defined is not a discrete disorder, then the attribution of the diagnostic label to symptomatology suffered in the aftermath of a traumatic event risks further suffering to those so labelled, including stigma (see Clement et al., 2015 for review of studies on help-seeking and stigma). If the diagnosis "lacks specificity: it is imprecise in distinguishing between the physiology of normal distress and the physiology of pathological distress" (Summerfield, 2001, p.97), it also risks abandoning those without it to loss of support for real suffering.

This has important ramifications for all those exposed to PTEs, but for those whose occupation involved repeated exposure, it is of even greater importance. For these reasons, the causal A1 aetiology and other potential predictors are examined in this programme of research.

Chapter 2 : Prevalence and predictors of PTSD

2.0 Introduction

This chapter reviews the literature regarding the prevalence rates of PTSD and its comorbid conditions of depression, anxiety and alcohol abuse in both the general and first responder populations, for comparison purposes. Predictors identified for the development and/or maintenance of PTSD are then reviewed. A summary of prevalence and predictors for firefighters is at Appendix D.

2.1 Prevalence rates within general populations

Prevalence rates within a population show the proportion of that population found to have a specified condition (PTSD) through the use of validated instruments and expressed here as a percentage. This percentage is described as "point prevalence" when found at a specific point; as "x month prevalence" when found during a specified period; or "lifetime prevalence" showing the proportion of people given a diagnosis over a lifetime.

The United States and Canada have recorded higher lifetime and 12 month prevalence rates than most Western European countries (except the Netherlands) which may be partly accounted for by the degree of exposure to PTEs because conditional prevalence are similar (Blanco, 2011). Differences in prevalence rates internationally may reflect the different instruments used (Creamer, Burgess & McFarlane, 2001), and may reflect different versions of the DSM or differences between the DSM and the ICD (O'Donnell et al., 2014; Kilpatrick et al., 2013). Higher rates in the United States than in Australia may imply "a cross-cultural difference in resilience to stress" (Creamer, Burgess & McFarlane, 2001, p. 1244).

Lifetime and 12 month prevalence rates have been investigated in studies carried out in America, Canada, Mexico, Chile, Germany, Sweden, Belgium, Switzerland, the Netherlands, France, Italy, Spain, Lebanon and Australia and in a cross-national study (Belgium, France, Germany, Italy, the Netherlands and Spain) (Blanco, 2011 pp. 52-55). Blanco's (2011) analysis reveals that the lifetime prevalence rate in the USA ranges from 1% (Helzer, Robins & McEvoy, 1987) to 9.2% (Breslau et al., 1998) and in Europe from 1.3% in Germany (Perkonigg et al., 2000) to 7.4% in the Netherlands (de Vries & Olff (2009). These rates can be compared to anxiety disorders (28.8%), mood disorders (20.8%), substance use disorders (14.6%) and any disorder (46.4%) (Kessler et al. , 2005). Lifetime

prevalence using DSM-5 criteria was reported at 8.3% (Kilpatrick et al., 2013). For Major Depressive Disorder, Kessler et al., (2005) reported lifetime prevalence at 16.6%. For Generalised Anxiety Disorder (GAD), Spitzer et al., (2006) reported studies finding rates in general medical practice between 2.8% and 8.5% and in the general population from 1.6 to 5%; Kessler et al., 2005 reported lifetime prevalence at 5.7%, with the highest at 7.7% in the 45-59 year age range, and lifetime prevalence rates were found in older people at 11% with a mean diagnosis of first onset GAD at the age of 35, with 24.6% reporting onset over the age of 50 (Zhang et al., 2015). Lifetime alcohol abuse was reported at a prevalence rate of 13.2% and dependence at 5.4% (Kessler et al., 2005).

Twelve month prevalence of PTSD analysed by Blanco (2011) ranged from 0% in Switzerland (Hepp et al., 2006) to 3.5% (Kessler et al., 2005). PTSD caseness in the past 12 months was reported at 4.7% using DSM-5 criteria (Kilpatrick et al., 2013). These can be compared to anxiety disorders (18.1%); mood disorders (9.5%) and any disorder (26.2%) (Kessler et al., 2005). The worldwide pooled current (point) prevalence rate of PTSD in the general population has been reported as 1.3 – 3.5%, by Berger et al., (2012) citing Creamer, Burgess & McFarlane (2001); de Vries & Olff (2009); Eun, Lee & Kim (2001); and Kessler et al., (2005), although an American study of a range of PTEs reported a current rate of 5-11% (Norris, 1992). In England, the 2007 Adult Psychiatric Morbidity Survey found a prevalence rate of 3% for current PTSD (McManus Meltzer & Wessely, 2009), and in an inner city population the current rate was 5.5% (Frissa et al., 2013).

2.2 Trajectories and a spectrum of responses to PTEs within general populations

Various trajectories of responses to trauma have been identified including three trajectories (Galatzer-Levy et al., 2011); four (Bonanno, 2004; 2005;); and six (Berntsen et al., 2012). Broadly speaking, these categorise chronic symptomatology; delayed onset; recovery (remission after a period); and resilient (mild and transient, functioning healthily over time). In the context of PTSD, resilience was designed as no or one symptom and recovery as two or more symptoms but no diagnosis in the aftermath of 9/11 (Bonanno et al., 2006). Resilience is the most common of the trajectories (Bonanno, 2004; Bonnano, Westphal & Mancini, 2011), and trauma researchers may typically consider a PTE to be traumatic when its victim does not (Boals & Hathaway, 2010). There are “multiple independent predictors of resilience outcomes” including perceived control, trait resilience, low negative affectivity; low ruminative response; trait self-enhancement and positive emotions together with demographic and exposure factors, availability of social support and economic resources, the role of life stress and one’s worldviews (Bonanno, Westphal & Mancini, 2011, p. 519).

Alternatively, PTSD may be regarded as a response to a traumatic event which lies at one end of a continuum (Ruscio, Ruscio & Keane, 2002) or as a dimensional phenomenon (Frankfurt et al., 2015) which would suggest that there are degrees of suffering ranging from none to clinical symptomatology. Network analysis avoids the categorical diagnosis of PTSD through connecting symptoms rather than "identifying symptoms specific to certain disorders" (McNally et al., 2014, p.10). Echoing this suggestion of a "spectrum" of PTE responses, DiGangi et al., (2013, p. 740) offer a "continuum of 'risk factor malleability'" for predictors of negative responses, with the relatively stable personality and cognitive factors at one end, less stable coping styles and life stressors at the other, and pre-trauma pychopathological/psychophysiological factors lying somewhere in between.

2.3 Predictors of PTSD within general populations

"One of the outstanding questions about posttraumatic stress disorder (PTSD) is why only a minority of trauma survivors who are exposed to a traumatic event develop PTSD" (Bryant & Guthrie, 2007, p. 812). Risk factors can be divided into pre-traumatic, peri-traumatic and posttraumatic (Brewin, 2003, pp. 50-60), which recognise pre-existing vulnerabilities, the nature of and subjective response to the PTE (which reflect Criterion A of the DSM-IV); and the coping mechanisms, environment and relationships an exposed individual experiences after a PTE.

On meta-analysis (Brewin et al., 2000), trauma severity, post-trauma lack of social support and life stress had stronger effect sizes than factors which preceded the trauma. Of these, similar effects were found in regard to the risks associated with being female, having a lower socioeconomic status, less education, lower intelligence, a previous psychiatric history and a family psychiatric history, childhood abuse and other trauma or childhood adversity. The smallest effect sizes were being younger and race (having minority status). Risk factors identified in a further meta-analysis (Ozer et al., 2003) found that the strongest predictors were perceived threat to life; perceived support, peritraumatic emotions and peritraumatic dissocisation, whereas weaker predictors were prior adjustment, trauma history and family history of psychopathology. The authors commented that "peritraumatic dissociation and, to a lesser degree, peritraumatic emotionality are as salient predictors as any yet identified" (Ozer et al., 68). On systematic review of the literature on longitudinal studies, pretrauma variables were categorised as cognitive abilities; coping and response styles; personality factors; psychopathology; psychophysiological and social ecological factors (including family of origin, social support and poverty (DiGangi et al., 2013). All ten studies of cognitive abilities reported that lower ability was a risk factor; all eight coping/response styles and all

personality factors in 14 studies except for self-esteem constituted risk factors; the majority of studies using pretrauma psychopathology as a predictor found that such psychiatric problems increased vulnerability; mixed results were reported for psychophysiological factors although arousal-related types were in the majority in predicting symptomatology; and, in the social ecological group, half demonstrated predictive effects related to family of origin and one found poverty to be a predictor (DiGangi et al., 2013).

The inherent negativity of PTSD is illustrated by the studies of predictors cited by DiGangi et al., (2013) including a coping style with a general negative cognitive bias (Constans et al., 2012); negative affectivity (Rademaker et al., 2011; Weems et al., 2007) and pre-trauma negative cognitions about self (Bryant & Guthrie, 2007). The latter appear to be particularly psychonoxious, also including negative cognitions with relation to self (Dunmore**,** Clark & Ehlers; 1999; 2001; Clohessy & Ehlers, 1999; O'Donnell et al., 2007; Lancaster, Rodriguez & Weston, 2011; Constans et al., 2012) and differentiating the processing in PTSD from that in complicated grief (Golden & Dalgleish, 2012). It is, however, arguably tautological to describe predictors of PTSD which are also symptoms, creating a situation "whereby certain dispositions and coping styles place people at risk for developing a condition that, definitionally, involves a negative disposition" (DiGangi et al., 2013, p. 740). Such dispositions or personality traits may influence appraisal of a PTE, for example, those with high levels of negativism (a "negative, dissatisfied, and hostile attitude") may appraise a situation as more alarming than those without, therefore becoming more anxious, and their attitude may also make them less prone to seeking support from others (Bramsen, Dirkzwager & van der Ploeg, 2000, p. 1116).

Although exposure to the PTE is critical to a diagnosis, it is perhaps more accurate to describe it as a "powerful temporal antecedent with a variable conditional probability of preceding the development of PTSD" (Friedman, 2011, p.5).

2.4 Disorders comorbid with PTSD: anxiety, depression and alcohol misuse within general populations

"More than 50% of people with a mental disorder in a given year meet criteria for multiple disorders" (Kessler et al., 2011) citing Demyttenaere et al., (2004) and Kessler et al., (2005). In England the most common mental disorder (CMD) was reported to be mixed anxiety and depressive disorder (9%), followed by generalised anxiety disorder (4.4%) and depressive episode (2.3%) (Deverill & King, 2009). Hazardous drinking was reported at 24.2%, with a rate in men of 33.2% as

against a rate in women of 15.7%, and hazardous drinking that is also harmful was reported at 5.8% for men and 1.9% for women. Alcohol dependence was reported at 5.9%, with a rate of 8.7% in men and 3.3% in women. (Fuller, Jotangia & Farrell, 2009).

PTSD has a strong comorbidity with other disorders (Kessler et al., 1995; Breslau et al., 1991; Davidson et al., 1991; Perkonigg et al., 2000; Klein & Alexander, 2006). Some comorbid disorders, including generalised anxiety disorder and major depression were ten times more likely in those with PTSD than those without (Davidson et al., 1991) and persons with subthreshold PTSD had a significantly higher risk of comorbid anxiety and depression than those with no PTSD (Marshall et al., 2001). The most common comorbid disorder with PTSD is depression (Brewin, 2003; Breslau et al.,2000). Comorbid anxiety disorders are associated with PTSD, although PTSD was less likely to be primary in these than in affective and substance use disorders (Kessler et al., 1995). PTSD and OCD can also co-exist (Pitman, 1993; Sasson et al., 2005; Gershuny et al., 2003). Alcohol abuse is commonly comorbid with PTSD (Breslau et al., 1991, Kessler et al., 1995) although in a longitudinal study, alcohol use was not predicted by trauma exposure irrespective of whether or not PTSD was reported (Breslau, Davis & Schulz, 2003). In her review of the literature on alcohol abuse in trauma exposed individuals, Stewart (1996) cited Green, Grace & Gleser (1985) reporting an association between grotesque death and alcohol abuse in people surviving a fire in the Beverly Hills Supper Club and a greater likelihood of such abuse two years later in those with greater exposure to the bodies. According to this review, the most common theory for the comorbidity of PTSD and alcohol abuse is self-medication (Stewart, 1996), and PTSD was “more often than not” primary with substance use disorders (Kessler et al., 1995, p. 1055).

2.5 Prevalence rates in first responders

The modern definition of “first responder” includes not only the traditional “blue light” services, but also non-traditional workers involved in reconstruction of infrastructure (Benedek, Fullerton & Ursano, 2007). First responders have been found to be more resilient than disaster survivors (North et al., 2002a, 2002b), but not necessarily more so than the general population, with a 10% current worldwide pooled prevalence rate as against that of the general population at 1.3 – 5% as reported by Berger et al. (2012). In comparison, UK Iraq War veterans had a point prevalence rate of 3 -6% and US veterans from the same conflict had a rate of 4 -17% (Richardson et al., 2010). Although PTSD prevalence rates in first responders have been recorded at high levels in the aftermath of traumatic events, they tend to drop over time (Stellman, Smith & Southwick, 2008; Cukor et al., 2011), although there are notable exceptions (Neria, DiGrande & Adams, 2011), for example, increasing PTSD rates

over time in firefighters following 9/11 (Berninger et al., 2010). Where studies are not longitudinal, it is not possible to state whether the rates would have remained high (Ozen & Sir, 2004; Guo et al., 2004).

Within mixed responder groups, prevalence rates vary widely, for example from 6.2% in police to 21.2% in unaffiliated workers in a study of 28,962 disaster workers at the World Trade Center (WTC) site (Perrin et al., 2007); 8.0% in a sample of police, fire, ambulance and coastguard responders (Andrews et al., 2006); 13.2% in emergency management professionals (LaFauci Schutt & Marotta, 2011); and 61.2% in a sample of police, firefighters and medical rescue workers (Ogińiska-Bulik, 2013). On meta-analysis, ambulance workers have the highest rates and police officers the lowest (Berger et al., 2012) which may reflect their level of contact with victims (Marmar et al., 1996). High rates for ambulance workers have been recorded in the UK (Bennett et al., 2004; Clohessy & Ehlers, 1999; Alexander & Klein, 2001); and the Netherlands (van der Ploeg & Kleber, 2003) but a low rate (6.7%) in Brazil, possibly because of the number of physician participants and the paramilitary structure of their division (Berger et al., 2007). Police officers have reported low distress in disasters (Marmar et al., 1996; Alexander & Wells, 1991) and a prevalence rate of 7% was recorded in police officers in the Netherlands (Carlier, Lamberts & Gersons, 1997). No differences were found between rates of anxiety, depression and hostility between police officers and various control groups including the military, firefighters and various employees (van der Velden et al., 2013). No significant differences in posttraumatic stress symptomatology were found between Polish firefighters, police officers and medical rescue workers, although higher avoidance was found in the medical workers (Ogińiska-Bulik, 2013). The range of prevalence rates in mixed emergency responders reflects the diversity of categories of rescue workers (Berger et al., 2012, Perrin et al., 2007).

Firefighters are frequently included in mixed emergency response research (e.g. Beaton et al., 1997; 1999; Ogińiska-Bulik, 2013; Perrin et al., 2007). It has been suggested that studies on these mixed groups of first responders reported lower rates of PTSD than firefighter-only studies (Del Ben et al., 2006). However, very low rates have been reported in firefighter-only studies; 0% (Monteiro et al., 2013) and 0.9% (Morren et al., et al., 2005), as have extremely high ones, such as 57% (Alghamd, Hunt & Thomas, 2013) and 100% (Hill & Brunsden, 2009). In firefighter-only groups, the methodology used appears to account for some of the marked variation in prevalence rates (Del Ben et al., 2006).

Methodological issues arise in comparisons between prevalence rates found through studies using different measures to assess PTSD symptomatology (Del-Ben et al., 2006). Those without items

verifying Criterion A exposure and Criterion F impairment may give rise to higher rates of prevalence (Meyer et al., 2012). To illustrate, use of the Clinician-Adminstered PTSD Scale (CAPS; Blake et al., 1995) returned a prevalence rate of 4.2%, and use of the self-report PTSD Checklist-Civilian (PLC-C; Weathers et al., 1993 returned a rate of 6.4% (Meyer et al., 2012). Different authors have also tended to use different cut-off points and these naturally provide different prevalence rates (Del Ben et al., 2006). The self-report Impact of Event Scale (IES; Horowitz, Wilner & Alvarez, 1979) used in some first responder studies (e.g. Al-Naser & Everly, 1999; Corneil et al., 1999; Bryant & Harvey, 1996; Regehr, Hill & Glancy, 2000) tends to return higher rates of PTSD because it does not measure all Criteria C or any D symptoms as reported by Del Ben et al., (2006). Its validity as a measure of distress was evidenced, but it is "severely limited in its content validity" in measuring PTSD (Joseph, 2000, p. 105). The Impact of Event Scale-Revised (IES-R; Weiss,& Marmar,1997) includes Criterion D symptomatology and has been used extensively in firefighter studies (e.g. Armstrong, Shakespeare-Finch, & Shochet (2014) and Tuckey & Hayward (2011) in Australian firefighters; Avsec, Novak, & Bajec (2012) in Slovenian; Lee et al., (2014) in Korean; Leykin, Lahad, & Bonneh (2013) in Israeli; Ogińska-Bulik (2013) in Polish; and Prati et al., (2013) in German and Italian firefighters). However, it has lower sensitivity over time since the event (Weiss, et al., 1995) and its subscale factor structure was unsupported in the firefighter population (Wagner, 2011). Creation or modification of measures may produce more thorough assessments of symptomatology (Del Ben et al., 2006) citing Wagner, Heinrichs & Ehlert, (1998) and Haslam & Mallon, (2003). Differences in symptomatology may be associated with the geographical location of the study or culture of participants, for example, as reported by Paton & Smith (1996), higher IES scores were reported in Australian firefighters than in UK and Japanese (Paton, Ramsay & Sinclair, 1995; Paton, Cacioppe & Smith, 1995) and diverse ranges are reported internationally, for example, 0% in Brazilian (Monteiro et al., 2013) and 57% in Saudi firefighters (Alghamd, Hunt & Thomas, 2013).

The cross-sectional, retrospective nature of much trauma research results in an absence of pre-event data, although there is longitudinal research in the firefighter population (e.g. Heinrichs et al., 2005; Bryant & Guthrie, 2005; 2007). Results can be significantly affected by the absence of pre-trauma data: pre-trauma data showed that apparent clinical levels of anxiety measured post-trauma had actually decreased in police officers (Alexander & Wells, 1991) and different concerns associated with increased posttraumatic stress psychopathology had arisen in firefighters post 9/11 than before (Murphy et al., 2004). Under-reporting of symptoms in firefighters has been noted (Nydegger, Nydegger & Basile; 2011; Wagner, Heinrichs & Ehlert, 1998; North et al., 2002b; Bryant & Guthrie, 2005; Dean, Gow & Shakespeare-French, 2003; Chamberlin & Green; 2010), although despite an

association between social desirability and lower symptomatology, there was no effect on identifying predictors (Meyer et al., 2012). Absence of documented records within fire departments may also affect apparent differences in prevalence (Corneil et al., 1999) and return rates of questionnaires has been reported as low in some firefighter studies (e.g. Brown, Mulhern & Joseph, 2002; Bryant & Harvey 1996).

2.6 Depression, anxiety and alcohol misuse in first responders

As with trauma in the general population, PTSD is not the only, or main, response to exposure in first responders. PTSD, major depressive disorder, anxiety and drug/alcohol problems are commonly reported (Kleim & Westphal, 2011; Benedek, Fullerton & Ursano, 2007; Ballenger et al., 2011; Huizink, et al., 2006; Psarros et al., 2008; Welch et al., 2014). Post- 9/11 studies recorded previous month prevalence rates of 11.1% for probable PTSD; 8.8% for probable depression; 5% for probable panic disorder; and 17% probable excess use of alcohol (Stellman, Smith & Southwick, 2008). Rates of major depressive disorder in non-rescue disaster workers at Ground Zero were reported four years after 9/11 at 3.2%; rates of GAD at 1.8%; and rates of panic disorder at 2.9%, with PTSD reported at 4.8% (Cukor et al., 2011). The prevalence of frequent binge drinking was higher in rescue/recovery workers at 9.8% than in Manhattan residents (5.9%) and workers or others in Manhattan (6.2%) (Welch et al., 2014). Although alcohol was used for pharmacological effects, it was also used for the sense of social community involved in being together having a drink, thereby a form of occupational social support (McCarroll et al., 1993).

Firefighter responders to disasters have recorded high rates for common mental disorders (CMDs), for example, depression and/or anxiety (Huizink, et al., 2006; Psarros et al., 2008) and prevalence of general psychiatric morbidity/psychological distress (Chang et al., 2003; Boxer & Wild, 1993). In critical incident (CI) response, firefighters' prevalence rates have ranged from 3% (Regehr, Hill & Glancy, 2000) and 5.4% (Chen et al., 2007) for severe depression, to 21.1% for depressive symptoms (Saijo, Ueno & Hashimoto, 2008). American firefighters reported rates of PTSD at 4.2%; depressive symptoms in the minimal range with moderate-to-severe symptoms at 3.5%; and anxiety scores in the normal range, with moderate to severe anxiety reported at 4.2% (Meyer et al., 2012). Brazilian firefighters reported rates of mild and moderate depression, both at 7.4%; mild anxiety at 26%; and moderate and severe anxiety each at 3.7% (Monteiro et al., 2013). Post-disaster prevalence of alcohol abuse stood at 24%, with a lifetime prevalence of 47% with high levels prior to the disaster (North et al., 2002a). In critical incident (CI) response, substance abuse has been recorded at 19% in German firefighters (Wagner, Heinrichs & Ehlert, 1998) while, in American firefighters, alcohol

misuse has been recorded at 29% (Boxer & Wild, 1993). Differentiating severity, Meyer et al. (2012) report probable and problematic alcohol abuse at 10.6% and 22.5% respectively for the previous year and at 25.4% and 40.1% respectively for lifetime prevalence. Brazilian firefighters reported hazardous drinking at a rate of 22.2% and 3.7% for harmful drinking with probable dependence (Monteiro et al., 2031). The intensity of involvement in critical incidents is associated with drinking to cope which is mediated by distress, and lower levels of resources might create more vulnerability to distress and thus more drinking to cope (Bacharach, Bamberger & Doveh, 2008).

2.7 Predictors of posttraumatic reactions and psychopathology in first responders

First responders including firefighters are exposed to a range of A1 stressors which may lead to PTSD (Carlier & Gersons, 1994; Marmar et al., 1996; Weiss et al., 1995; Lindahl, 2004; Del Ben et al., 2006). Although some first responder occupations are widely considered to be more stressful, the literature is becoming increasingly less supportive of the notion that they are, by their nature alone, predictive of PTSD and other disorders (e.g. Paton, Smith & Violanti, 2000; van der Velden et al., 2013). In both the military and in first responders, their occupations also have positive aspects such as the exercise of one's professional skills and the perception of having carried out a task well (Jones, 1985; Alexander & Wells, 1991; McCarroll et al., 1993; Moran & Colless, 1995). Vulnerability created by exposure is certainly not confined to these specific occupations, as others, such as train drivers exposed to suicides, war correspondents, and workers in banks or post offices exposed to armed robberies, have also been reported as having higher prevalence rates (see Skogstad et al., 2013 for the literature discussion).

Firefighting is one of the most dangerous civilian careers in America (Farnsworth & Sewell, 2011) and firefighters are subjected to a wide range of stressors capable of satisfying DSM-IV Criterion A1 which may lead to PTSD (Lindahl, 2004; Del Ben et al., 2006; Meyer et al., 2012). However, they appear to be generally healthy in mental health terms (Kalimo et al., 1980; Harris, Baloğlu & Stacks, 2002; Meyer et al., 2012; Del Ben et al., 2006) and those with high resilience appeared protected from symptomatology (Lee et al., 2014). Nor do they appear to have had their sense of self-worth or assumptions that the world is benevolent and meaningful shattered to any greater degree than members of the public (Wagner, McFee & Martin, 2009). Firefighters face danger not just in responding to fires but also to incidents in which they are exposed to hazardous conditions such as chemical spillages, retrieval of the dead and injured from collapsed structures, aircraft and trains, and industrial accidents, drugs laboratories and farms with dangerous chemicals and wiring, booby traps

and guards (personal communication, fire officer, UK, 03.01.14). Swedish firefighters have reported being assaulted and threated and feeling unsupported both by their own organisation and society (Jacobsson et al., 2014). Further, being regularly exposed to the bodies of the dead, intact or otherwise may be distressing to all those responding to incidents (Jones, 1985; Beaton, et al, 1998; McCarroll, et al, 1993; Morren, et al., 2005; Del Ben et al., 2006). The death of children is routinely reported as the most, or amongst the most, distressing traumatic events for firefighters (Haslam & Mallon, 2003; Brown, Mulhern & Joseph, 2002 ; Jeanette & Scoboria, 2008); and commonly leads to the experience of intrusive memories in ambulance workers (Clohessy & Ehlers, 1999).

Firefighters are also subject to organisational stressors such as shiftwork, resource demands (Bacharach, Bamberger & Doveh, 2008; Jacobsson et al., 2014) and management support issues (Cook & Mitchell, 2013). Higher occupational stress predicted higher symptomatology of PTSD, depression, anxiety and alcohol abuse in American firefighters (Meyer et al., 2012). Firefighters' work also involves a combination of long periods of inactivity followed by high activity (Cook & Mitchell, 2013) consisting of firefighting itself, but also of directing rescue work and managing crowds (Del Ben et al., 2006), and some firefighters report a poor quality of life with sleep disturbance, perceived physical conditions and marital discord (Chen et al., 2007). The most stressful incidents were major fires, drownings, completed suicides, and persons trapped in road traffic collisions (Jacobsson et al., 2014). Cook & Mitchell (2013) describe predictors of vulnerability in first responders including being younger and single; prior psychological history; threats to safety and sustaining physical injury; negative beliefs about the self and lower self-worth; lower social support; organisational factors; longer experience on the job and multiple exposure; holding a supervisory rank; and not feeling in control. Risks seem intertwined (Corneil et al., 1999; Dean, Gow & Shakespeare-Finch, 2003).

The next section describes predictors of psychopathology in fire fighters and other first responders organised into pre-trauma, peri-trauma and post-trauma categories.

2.7.1 Pre-trauma factors in first responders

Sex

Women generally tend to report higher rates of PTSD than men, but women in the emergency services have recorded lower rates than men (Bennett et al., 2004; Berger et al., 2007) and lower rates than female civilians (Lilly et al., 2009). On meta-analysis, no association was found between sex and PTSD, but rigorous selection and training may decrease the risk of psychopathology (Berger et al., 2012). Sex differences have been reported in the way men and women describe their

experiences and express their feelings, for example, men expressing more empathy than women (Jacobsson et al., 2014).

Marital status

There are inconsistencies in the literature regarding marital status and psychological symptomatology. Both never married and previously married people had a higher risk of PTSD in the general population (Creamer, Burgess & McFarlane, 2001). Men with PTSD were more likely to be unmarried (Berger et al., 2007) and higher rates of common mental disorders ("CMD", which include anxiety and depression) in the UK military were found in those who had been divorced, separated or widowed, as was also the case within the general population (Goodwin et al., 2014). Being married was a predictor of PTSD symptomatology in American firefighters on multiple linear regression analysis of demographic variables, but was no longer upon a final backward linear regression of both demographic and occupational predictors (Del Ben et al., 2006), and marital status was not a significant predictor of psychological symptoms in American firefighters (Meyer et al., 2012). Being married was a protective factor in respect of PTSD caseness for American, but not Canadian, firefighters (Corneil et al., 1999). Sample sizes of 131 (Del Ben et al., 2006) and 142 (Meyer et al., 2012) were similar and both used versions of the Posttraumatic Stress Disorder Checklist – Civilian Version (PCL; Weathers, Litz, Huska & Keane, 1994) although in the former accompanied by the Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979) and in the latter by the Clinican Administered PTSD Scale (CAPS; Blake et al., 1995). The sample sizes were considerably higher for American firefighters (*n* = 203) and Canadian (*n* = 625) in Corneil et al.'s (1999) study, which also utilised the IES. The authors of this study suggested that, since the rate of previous divorce in the American sample was almost twice as large as in the Canadian, "perhaps an off-shift haven is even more important for a U.S. urban firefighter who is exposed to more frequent traumatic incidents on shift than their Canadian counterparts" (p. 140.) The methodological differences between these studies of American firefighters may also reflect the use of different instruments, for example, that the IES is an incomplete measure of DSM-IV criteria, whereas the PCL is complete (see Del Ben et al., 2006 and Meyer et al., 2012 for this discussion).

Prior military service

PTSD first gained official psychiatric recognition following the experience of American veterans of the Vietnam War (Friedman, 2011). Since many veterans join the fire service - in one study 44% of

firefighters were veterans – (Meyer et al., 2012) - it has been thought that persons with military history might account for rates of PTSD in firefighters. However, this does not appear to be inevitably the case (Meyer et al., 2012).

Personality traits and individual differences

Personality traits have been associated with PTSD in the military and first responders, for example anger and hostility (Orth & Wieland, 2006); anger (Novaco & Chemtob, 2002; Meffert et al., 2008; Evans et al., 2006); high hostility and low self-efficacy in firefighters (Heinrichs et al., 2005); and neuroticism in first responders (LaFauci Schutt & Marotta, 2011) including firefighters (McFarlane, 1989; Wagner, McFee & Martin, 2010); but not volunteer firefighters (Wagner & O'Neill (2012). Type D personality (incorporating negative affectivity and social inhibition) did not predict posttraumatic stress symptomatology in soldiers (Rademaker et al., 2011), but was associated with increased symptoms in firefighters (Ogińska-Bulik & Langer, 2007). Negative affectivity/negativism has predicted symptomatology (Rademaker et al., 2011; Bramsen, Dirkzwager, & van der Ploeg, 2000) and been associated with increased symptoms (Ogińska-Bulik & Langer, 2007).

In firefighters "approach" coping predicted less distress (Baker & Williams, 2001), low self-efficacy was associated with greater distress (Rebacz, undated) and predicted PTSD symptomatology (Heinrichs et al, 2005) and both low self-efficacy and external locus of control were associated with depression; but only mildly or not associated with PTSD respectively (Regehr, Hill & Glancy, 2000). With higher levels of exposure to traumatic incidents, greater task-focused coping was related to lower distress, but at lower levels, emotional-focused coping was related to lower distress (Brown, Mulhern & Joseph, 2002). Although pre-deployment repressive coping styles (low levels of anxiety with high levels of social desirability) predicted post-deployment PTSD symptomatology in health care professionals, pre-deployment trait anxiety was the major cause (McNally et al., 2011). Optimism was associated with lower distress in rescue/recovery workers (Dougall et al., 2001).

Pretrauma cognitions

In firefighters, pre-trauma maladaptive appraisals of self (including catastrophic thinking about one's own emotional responses, generally negative views about oneself and hopelessness) at the outset of their career accounted for 24% of the variance in posttraumatic stress symptomatology at 12 months (Bryant & Guthrie, 2005), and at 4 years' service, 20% of PTSD variance was accounted for by negative pre-trauma appraisals of self after controlling for traumatic events and pre-existing stress (Bryant & Guthrie, 2007). Self-devaluation (for example, that is one is "abandoned, inadequate and worthless") and prospective cognitions of harm to oneself were associated with symptoms of

complicated grief, but negative self-related attributions were not so associated in a community sample (Golden & Dalgleish, 2012, p. 514).

Pre-trauma psychopathology and family history

Pre-existing vulnerabilities including family history of psychiatric disorder predicted posttraumatic symptomatology in firefighters (McFarlane, 1988); and previous psychiatric treatment was associated with PTSD in firefighters (McFarlane, 1988, 1989; Del Ben et al., 2006). Receiving counselling was a risk factor for firefighters (Corneil et al., 1999) and associated with an elevated risk following 9/11 in all four study years *(*Berninger et al., 2010).

Age, experience and rank

Some studies have found that younger firefighters are at greater risk than older (Chiu et al., 2011; Psarros et al., 2008) and others that older firefighters are at greater risk of PTSD symptomatology or distress (Chang et al., 2008; Chamberlin & Green, 2010) which may be because of having more years in service (Nydegger, Nydegger & Basile, 2011; Dean, Gow & Shakespeare Finch, 2003; Regehr, et al., 2003a; Corneil et al., 1999; Moran & Britton, 1994; Wagner, Heinrichs & Ehlert, 1998; Chang et al., 2003; 2008; Alghamd, Hunt & Thomas, 2013). But age/years of service was not associated with PTSD symptomatology (Ogińska-Bulik, 2013; Del Ben et al., 2006; Wagner, McFee & Martin, 2010; Meyer et al., 2012), although the age at which they had become firefighters predicted symptomatology (Del Ben et al., 2006). Rather than years of service overall, earlier start date and longer duration of work at the WTC site were significant risks for firefighters working at the WTC in the 9/11 response (Perrin et al., 2007; Berninger, et al., 2010) including those who had subsequently retired (Chiu et al., 2011), and those who retired with a WTC-related disability (Berninger, et al., 2010). Associations between alcohol misuse and both length of service and age, and between depression and age were found in Brazilian firefighters (Monteiro et al., 2013), although this was a small sample (n=27). Rank is associated with both age and years of service but the literature is also inconsistent, with studies showing symptoms to be related to higher rank (Cook & Mitchell, 2013; Regehr, Hill & Glancy, 2000) and only in American firefighters, not Canadian (Corneil et al., 1999). Studies also show rank not to be associated with symptomatology (Meyer al., 2012) but only in Canadian firefighters (Corneil et al., 1999). Unable to determine whether career and auxiliary (part-time) firefighters reported different distress levels only because of their rank, Dean, Gow & Shakespeare-Finch (2003) pointed out that it did not appear to be the determinative factor, but rather that distress arose from a 'complex interaction of variables such as age, the number of firefighting and non-firefighting traumatic events attended and length of firefighting service' (p. 9).

Training

There is no amount of training that can prepare firefighters for the extreme experiences they have according to Barnes (1999). However, some studies suggest that training might be a factor in resilience, for example, in rescue workers as a group, higher prevalence of posttraumatic stress symptomatology has been found in untrained volunteers (Perrin et al., 2007,; Hagh-Shenas et al., 2005; Guo et al., 2004). Although firefighters sustained a major loss of life at the World Trade Center, the greatest occupational risk was for workers who were not professional rescuers (for example, those in construction) and volunteers (Perrin et al., 2007). In a systematic review and meta- analysis of rescue workers, no differences were found between the groups, which the authors speculated might be as a result of "self-selection of highly resilient volunteers" (Berger et al., 2012, p.8). Training requirements may differ from country to country, or even within countries. Further, training for retained (part-time) firefighters in the UK varies from service to service. The majority of competencies are trained to the same standard although, in some cases, the training is less intense and delivered over a longer period. Because of the limited time available for retained firefighters to train on a weekly basis, some specialisms are not included for all retained units e.g. road rescue and hazardous materials, and some units are trained specifically in one specialism because of their geographical location, e.g. water rescue. Additionally, many retained firefighters serve as whole time officers on one station and retained firefighters in their home towns (personal correspondence: UK firefighter, 1.10.2013). Event and task-specific training appear to be relevant (Alvarez & Hunt, 2005). In the 9/11 rescue and recovery response, medical and disaster personnel who carried out firefighting tasks, and sanitation workers who carried out search and rescue tasks showed the highest rates of PTSD (Perrin et al., 2007) providing further support for the importance of task-specific training.

Thus, according to the literature, there is no clear-cut association between any demographic, exposure, experience, training and volunteer status and psychopathology.

Organisational and life stress

Firefighters face organisational stressors such as shiftwork, resource demands and management support , with their work encompassing long periods of inactivity followed by high activity (Cook & Mitchell, 2013) including responding to false alarms (Del Ben et al., 2006; Barnes, 1999). It has been suggested (Corneil et al., 1999) that high odds ratios for PTSD due to work strain in American and Canadian firefighters may reflect the paramilitary, hierarchical structure of the occupation.

Several studies show that health difficulties and psychopathology relate to operational factors such as shiftwork, low supervisory support, role conflict, reduction in manpower or other resources,

equipment failures and so forth (Kalimo et al., 1980; Morren et al., 2005; Saijo, Ueno & Hashimoto, 2008; Malek, Mearns & Flin, 2010; Boxer & Wild, 1993; Jacobsson et al., 2014; Bacharach & Bamberger, 2007; Bacharach, Bamberger & Doveh, 2008). Factors which are protective against the impact of disaster work (Alexander & Klein, 2009) include good organisation, a clear definition of duties, teamwork and a sense of being appreciated (p. 90). Other factors include organisational support (McCarroll et al., 1993; Evans, Pistrang & Billings, 2013)

Higher occupational stress is a significant predictor of PTSD, depression, anxiety and alcohol abuse in American (Meyer, 2012) and of PTSD in Australian firefighters (Armstrong, Shakespeare-Finch & Shochet, 2014).

2.7.2 Peri-trauma factors

Exposure: multiple exposure and intensity of exposure

DSM-5 (APA, 2013, p. 271) incorporates a new Criterion A4: "experiencing repeated or extreme exposure to aversive details of the traumatic event(s) (e.g. first responders collecting human remains; police officers repeatedly exposed to details of child abuse)". This may be a helpful expansion in the case of firefighters' repeated exposure, but difficulty remains with interpreting the meaning of "exposure" using the DSM-IV criteria current at the time of the current research.

Using the term "multiple exposure" to denote "trauma severity", the literature on first responders including firefighters is inconclusive with associations found in some studies (Bryant & Harvey, 1996; Sliter, Yale & Yuan, 2013; Rebacz (undated); Lee et al., 2014) but not in others (Beaton et al., 1999; Meyer et al., 2012; Corneil et al., 1999; Declercq et al., 2011). If "trauma severity" is interpreted instead as "intensity" in one PTE, difficulties arise which are more than merely semantic, because severity can be objectively or subjectively determined. In disasters, the most consistently documented predictors of PTSD are exposure factors (Weiss et al., 1995; Neria, DiGrande & Adams, 2011; Curkor et al., 2011; Chiu et al., 2011; Perrin et al., 2007); including loss of a family member or friend (Brackbill et al., 2009; Stellman, Smith & Southwick, 2008) and 9/11 related job loss (Brackbill et al., 2009). Those firefighters who had worked at the WTC site for the longest had the greatest vulnerability to PTSD risk (Berninger et al., 2010), and those Fire Department New York (FDNY) firefighters who were present during the collapse of the Twin Towers showed a prevalence rate of PTSD of 12-13% (Corrigan et al., 2009). The FDNY had also lost 343 fellow firefighters. However, even the most arduous and unpleasant types of exposure do not necessarily result in increased symptomatology, as was the case for rescuers responding to the I-880 freeway collapse (Marmar et

al., 1996); Navy divers searching for the dead following the TWA 800 crash into the ocean (Leffler & Dembert, 1998); and police officers recovering the dead after the Piper Alpha explosion (Alexander & Wells, 1991). Despite the severity of exposure to bushfires, pre-existing vulnerabilities were better predictors of posttraumatic stress symptomatology in a longitudinal study of Australian firefighters (McFarlane, 1989).

There does not appear to be a strict linear relationship between exposure and symptomatology which may be due to other factors influence how the severity of exposure is experienced, for example, resulting from an individual's own vulnerabilities (Meyer et al., 2012), or by their nature (Declercq et al., 2011), that is, how psychonxious they are (Alexander & Klein, 2001).

Exposure to the dead

Exposure to the dead is a feature of work as a first responder, but studies have not been able to establish conclusively whether it is invariably associated with psychopathological responses. Exposure to the dead was associated with posttraumatic symptomatology including that of acute stress disorder (Chang et al., 2003; Grieger et al., 2000; Sutker et al., 1994; Ursano et al., 1999; McCarroll et al., 2001; Biggs et al., 2010) and increased alcohol misuse in disaster survivors (Green, Grace & Gleser, 1985). Although associated with PTSD, tending to victims with "grotesque burn injuries" best predicted PTSD (Epstein, Fullerton & Ursano, 1998) and body handling is not always associated with PTSD/ASD symptomatology (Stewart et al., 2004; Leffler & Dembert, 1998; Ben-Ezra et al., 2008). Body handling may be associated with distress (Solomon, Berger & Ginzburg, 2007; Haslam & Mallon, 2003; North et al., 2002b; Marmar et al., 1996; Alexander & Wells, 1991; Fullerton et al., 1992). The effects of body handling on PTSD and other distress symptoms may be significant in the short term but diminish over time (Jones, 1985; Taylor & Frazer, 1982; North et al., 2002b) and may be moderated by social support (Jones, 1985) – see below.

Emotional involvement: identification with the victim

Exposure to the dead alone may be insufficient to lead to psychological symptomatology. Rather, the personal meanings the responder attaches to a PTE, (Marmar et al., 1996) may be unconscious, and arise through identification with the victim, "a cognitive process of emotional involvement by which we see other people as being like or similar to ourselves" (Ursano & Fullerton, 1990, p. 1768).

The visceral response to the death of a child appears to be universal amongst first responders (see e.g. Jones, 1985; Leffler & Dembert, 1998; McCarroll et al., 1993; Fullerton et al., 1992; Clohessy & Ehlers, 1999; Ursano, McCarroll & Fullerton, 2007; Boxer & Wild, 1993; North et al., 2002b; Haslam & Mallon, 2003; Jeanette & Scoboria, 2008; Halpern et al., 2009; Declercq et al., 2011; Monteiro et

al., 2013), but such exposure does not necessarily lead to PTSD symptomology (North et al., 2002b; Monteiro et al., 2013). Death of a colleague is routinely considered to be one of the most stressful (Ursano, McCarroll & Fullerton, 2007) including police officers (Stephens & Miller, 1998; Weiss et al., 2010) and firefighters (Beaton et al., 1998; Fullerton et al., 1992; Cook & Mitchell, 2013). When there is a death on duty of a UK firefighter, it is normal for many off-duty firefighters from all over the UK to attend the funeral because the dead were colleagues, perceived as "brothers in fire" (personal communication UK fire officer, 16.09.14). Associations between the death of a colleague and psychopathology are suggested in firefighters (Berninger et al., 2010; Corrigan et al, 2009; Hill & Brunsden, 2009; Beaton et al., 2004; Perrin et al., 2007). In Beringer et al.,'s (2010) large-scale longitudinal study of New York firefighters following 9/11, levels of elevated PTSD risk did not drop over time, (9.8% at year 1 to 10.6% at year 4) and for every death in a firehouse, a firefighter member had a 10% increase in odds of having an elevated risk, but this was described within the context of "work stressors" (p. 564). Corrigan et al., (2009) also reported that those New York firefighters who had suffered the death of a colleague while working at the site of the WTC attacks were four times more likely to have an elevated PTSD risk than firefighters who had not. Given the loss of 343 firefighter/paramedics at the WTC, it is possible that identification with the victim was a factor in the increased risk of PTSD symptomatology, or it could be that deaths of firefighter colleagues are analogous to the deaths of family members. Identification with the victim (for example, thinking it could have been me/family/friend) is associated with PTSD symptomatology (Ursano et al., 1999; Kirby, Shakespeare-Finch & Palk, 2011; Cetin et al., 2005). However, PTSD symptomatology does not always arise even when the victim actually is known (Tucker et al., 2002).

A further aspect of exposure to the dead which provokes an attribution of meaning to the event is subtle, that of handling personal effects (McCarroll et al., 1993; Ursano, McCarroll & Fullerton, 2007; Leffler & Dembert, 1998). Because it is a common misconception that possessions will be less disturbing than dead bodies, inexperienced personnel are sometimes charged with this task, but it is the personal effects which "… have the power to humanize the deceased. They provide a link between the dead and the worker that is often not present until the remains acquire a name or otherwise begin to take on human properties, which can occur when personal effects are associated with the deceased" Ursano, McCarroll & Fullerton (2007, p. 232).

Ursano, McCarroll & Fullerton (2007, pp. 232-235) reported several examples of the impact personal possessions can have upon those working with the dead. Personnel at Dover Air Force base working with the personal possessions of one victim began to imagine that they knew him and his family; after the Sioux City air crash rescue workers were distressed to find handwritten materials; young

and inexperienced workers after Operation Desert Storm handled the personal effects "gingerly"; (p. 233) and when the US Army plane crashed in Gander, Newfoundland the week before Christmas, the "discovery of toys in the wreckage sent waves of anxiety and concern through the disaster workers" (Ursano, McCarroll & Fullerton, 2007, p. 233). Graves registration personnel working during the Vietnam War on screening letters and photographs belonging to the dead before sending them were more at risk than those who handled the dead: "You know, you sit there day after day and read through a guy's stuff, especially if you've got children and if you've got any kind of feeling within you whatsoever. But some of them just couldn't cope with it. Some had to be sent back to the mortuary side and some had to be put back for reassignment" (Ursano, McCarroll & Fullerton, 2007, p.233).

A variant of these vicarious cues arises through exposure to seeing pictures or hearing names of victims or their families in the media (McCarroll et al., 1993). Particularly significant dates in the calendar are also cues for identification. As one New York City firefighter explained "A few years ago there was a Christmas fire involving a mother and four kids. We heard the screams but could not get to them because the fire was too much. I think about that every Christmas." (Fullerton et al., 1992, p. 373).

Poignantly, identification with the dead may also serve a coping function. All of the dead soldiers following an aviation disaster were from the 101st Airborne Division in Ft. Campbell, Kentucky, whose patch is the "Screaming Eagle". Ten days after the crash, a drawing of it with a tear added under its eye was put on the mortuary wall and "became a symbol of those lost in the tragic air crash at Gander" (Ursano & Fullerton (1990)., p. 1770).

Mechanisms for identification

The mechanism through which one comes to identify with the dead appears to be recognition of the humanity of the body. Aspects of the body itself are important in that intact bodies may be more distressing than non-intact ones because it is easier to view the former as human (McCarroll et al., 1993). Discomfort was felt by Air Force personnel working with the dead following the USS *Iowa* explosion when bodies were still clothed, because this made them seem more real (Ursano & Fullerton, 1990). But it appears to be the face which is particularly humanizing: "I think we key on the face of that person. If there isn't a face or a head, it seemed like the whole focal point of expression was gone" (Ursano, McCarroll & Fullerton, 2007, p. 230); and "I don't want to look at the face because it may remind me of someone I know." (Fullerton et al., 1992, p. 373).

A2 and other emotional responses

DSM-IV Criterion A2 responses of intense fear, helplessness and horror all contributed to PTSD symptomatology, with the intensity of these responses being more predictive than the event itself (Declercq et al., 2011). Other studies have found one or other of the A2 emotions to be stronger, for example, Del Ben et al., (2006) found only horror to be associated with PTSD on regression in American firefighters. Helplessness was associated with posttraumatic stress in firefighters (Bryant & Harvey (1996) and was reported in UK firefighters as having the effect of perceiving an incident as traumatic (Haslam & Mallon, 2003). Alexander & Klein (2001) suggest that feelings of helplessness may contribute to an incident being more psychonoxious than others. When UK firefighters became casualties themselves in an explosion and their equipment was destroyed such that they were unable to perform in the usual way, they reported feelings of helplessness and guilt, and all 6 members of the watch interviewed still reported PTS symptomatology 14 years after the incident (Hill & Brunsden, 2009).

That emotion itself may be considered problematic by some firefighters is illustrated by results showing that fear of emotion was the strongest individual predictor of PTSD symptomatology in firefighters (Farnsworth & Sewell, 2011) and UK police officers showed reluctance to admit to being affected by their work (Evans, Pistrang & Billings, 2013).

2.7.3 Post-trauma factors

Intrusions and avoidance

The hallmark symptom of PTSD is the re-experiencing of the traumatic event through recurrent, involuntary, intrusive thoughts, dreams or cues which are associated with distress (Ehlers & Steil, 1995). As intrusions are a symptom of PTSD, it is arguably tautological to describe them as a predictor (see DiGangi et al., 2013), but notwithstanding, and understandably, they have. For example, firefighters experiencing intrusions at 4 months were not found on interview to have PTSD, but all of those who did develop PTSD at 8 months had experienced intrusions at high levels at 4 months, suggesting that intrusions were insufficient alone, but nonetheless necessary for symptomatology to develop (McFarlane, 1988). Similarly, intrusions/re-experiencing were associated with PTSD in exposed Japanese firefighters (Mitani, 2008) However, police body handlers working on the Piper Alpha disaster response reported intrusive images, but no PTSD (Alexander & Wells, 1991); volunteer firefighters in the Netherlands reported re-experiencing and other PTSD symptomatology, but the prevalence rate of PTSD in this group was 0.9% (Morren et al., 2005.); and although over one

quarter of firefighters reported flashbacks, they were not associated with PTSD (Haslam & Mallon, 2003).

As with intrusions, avoidance is a symptom of PTSD, thereby subject to the same point regarding tautology (DiGangi et al., 2013). Avoidance has been found to be both maladaptive and adaptive in psychopathological terms. As with survivors of disaster, where avoidance predicts distress (Joseph et al., 1996), the sole predictive factor for increased PTSD symptomatology in firefighters/paramedics at 6 month follow-up was a form of avoidance and numbing (Beaton et al., 1999). Avoidant coping explained most variance in symptomatology (Brown, Mulhern & Joseph, 2002), and avoidance coping increased to the highest levels at 9 and 12 months after responding to an aviation disaster and was associated with distress (Dougall et al., 2001). First responders commonly report avoidance/distancing strategies at the time of the traumatic event, particularly those dealing with the dead (McCarroll et al., 1993; Taylor & Frazer, 1982; Ursano & Fullerton, 1990; Alexander & Klein, 2009) and described as "alienation" (Pitman, 1993, p.103) in posttraumatic OCD. Avoidance has been identified through spontaneous viewing of human remains as objects which resulted in less stress (Taylor & Frazer, 1982) and such strategies have been described as seeming to "promote the use of denial as a 'natural defence mechanism', for example, "not looking at the face, not learning the names of the dead, and otherwise avoiding situations that 'humanize' the body appear to protect the workers" (McCarroll et al., 1993, p. 214). Similarly, nearly all of the Air Force volunteers working in the mortuary with the bodies of naval personnel killed in the USS *Iowa* explosion in 1989 avoided looking at the faces and hands of the dead, or even their images on television (Ursano & Fullerton, 1990). Cognitive shifting or distraction through changing the focus from the stressor to something else is possibly positive in the short, but not long term in firefighters (Nydegger, Nydegger & Basile, 2011). In the aftermath of a PTE, work event cognitive reappraisal which includes trying to work out how alternative outcomes could have been achieved is predictive of PTSD symptomatology in firefighters (Armstrong, Shakespeare-Finch & Shochet, 2014) whilst increased "mindfulness-related acceptance without judgment" is associated with a decrease in PTSD in police officers (Chopko & Schwatz, 2013, p. 6).

Social support

As in the general population (Brewin et al., 2000, Ozer et al., 2003), social support is a protective factor against development of PTS symptomatology in first responders (Kleim & Westphal, 2011; Prati & Pietrantoni, 2010; Meyer et al., 2012; Dougall et al.,2001). However, there is no uniformity in relationships between type of support and mental health (Prati & Pietrantoni, 2010) and aspects

of it are "likely to be complex and dynamic (Schnurr, Lunney & Sengupta, 2004, p. 93). For example, the combination of low social support and high self-blame accounted for most significant diagnoses and symptoms in Meyer et al.'s (2012) study of American firefighters; and more optimistic disaster workers following the USAir Pittsburgh crash reported having more social support (Dougall et al., 2001).

Perceived social support had a greater effect size than received on meta-analysis of first responders (Prati & Pietrantoni, 2010), and, as with survivors of disasters in which social support may help in reappraising the event (Joseph et al., 1991), talking about an incident can be helpful (Alexander & Wells, 1991; Greenberg et al., 2003) whilst avoiding talking about it has been associated with psychopathology in police officers (Davidson & Moss, 2008). Some firefighters reported a prevailing macho attitude, whereas others valued group support (Regehr, 2009) and some police officers felt restricted in showing emotion (Evans, Pistrang & Billings 2013).

Source of first responder social support

Various sources provide support (Paton, 1997) including family, friends and commanders and all seemed to provide a buffer between exceptionally high exposure and symptomatology (Bartone et al., 1989). Both supervisory and peer support was considered important for body handlers (McCarroll et al., 1993); Jones, 1985; Alexander & Wells, 1991; Fullerton et al., 1992); although optimally if it was timely, unobtrusive and easily available (Alexander & Wells, 1991). Timing may also influence the source of social support, which was primarily professional during exposure, whilst both family and organisational support were critical after exposure (McCarroll, et al., 1993).

Professional support plays a role in reports of low symptomatology (Alexander & Wells, 1991; Alexander, 1993). In ambulance workers, lack of social support from colleagues and supervisors was a predictor of posttraumatic symptomatology (van der Ploeg & Kleber, 2003), but not in student paramedics, although there was a relationship between exposure, lack of peer social support and negative attitudes towards the expression of emotion (Lowery & Stokes, 2005.) In South African Emergency Care Practitioners, perceived availability of emotional support from friends was the most significantly associated with PTSD symptomatology but no form of support served as a buffer between exposure and PTSD (Basedau, 2007).

Whether support from a spouse or partner at home is beneficial is not clear cut, as illustrated by some military studies. For American soldiers with high levels of marital satisfaction, greater frequency in communication with their wives during deployment with Operations Iraqi and Enduring Freedom predicted lower levels of PTSD, but only if those communications were tangible, e.g.

letters, emails and packages (Carter et al., 2011). For soldiers who reported lower marital satisfaction, however, these tangible communications predicted greater PTSD. Spousal support is not always available, for example, some body handlers described their "first (and sometimes only) attempt to tell their spouses how they felt about their work and reported that they were unlikely to repeat the experiment" (McCarroll et al., 1993, p.213).

The perception (or experience) of negative social support can be particularly toxic, as illustrated by another military study. Some soldiers' symptomatology decreased upon deployment and increased on returning home. Given their reports of interpersonal childhood violence, less education, and more symptomatology of depression and PTSD than other soldiers, the authors observed that these soldiers may have benefited from social support during deployment which was not present at home (Berntsen et al., 2012).

Firefighters and social support

Social support has been widely researched amongst firefighters (Alghamd, Hunt & Thomas, 2013; Armstrong, Shakespeare-Finch & Shochet, 2014; Avsec, Novak & Bajec, 2012; Beaton et al., 1997; Boxer & Wild, 1993; Chamberlin & Green, 2010; Chen et al., 2007; Corneil et al., 1999; Farnsworth & Sewell, 2011; Fullerton et al., 1992; Haslam & Mallon, 2003; Hill & Brunsden, 2009; Jacobsson et al., 2014; Jeanette & Scoboria, 2008; Meyer et al., 2012; North et al., 2002b; Nydegger, Nydegger & Basile, 2011; Ogińiska-Bulik , 2013; Regehr et al., 2003a, 2003b, 2009; Saijo, Ueno & Hashimoto, 2008; Tuckey & Hayward, 2011; Varvel et al., 2007).

The nature of such support is "somewhat unique" and is "a consistent, long-term, highly-defined social network [which] might be compared with a family or kin system" (Corneil et al., 1999, p.138-139).

Both organisational and family social support had a protective effect on American and Canadian firefighters with multiple exposure to traumatic events (Corneil et al., 1999) and low social support and/or high relational conflict indicated a higher risk of poor mental health (Beaton et al., 1997). Seeking support from others predicted lower symptomatology in Australian firefighters (Chamberlin & Green, 2010) and higher perceived social support was associated with lower levels of PTSD in in Saudi firefighters (Alghamd, Hunt & Thomas 2013). Lower reported social support predicted symptomatology of posttraumatic stress symptoms in Canadian firefighters with more experienced firefighters reporting lower support than recruits (Regehr et al., 2003a). In Japanese firefighters, both those who scored highly on the Japanese language version of the IES-R (IES-R-J; Asukai, 1999)

but who were not yet diagnosed with PTSD, and those who had been diagnosed, received less social support than those who scored lower on the scale (Mitani, 2008).

In contrast, Armstrong, Shakespeare-Finch & Shochet (2014) working with Australian firefighters, found that social support became non-significant as a predictor of PTSD symptomatology once the other coping strategies of reappraisal, seeking support and emotional expression, and self- care entered their final model. Similarly, negative social interactions were more predictive of PTSD than simply social support, although the presence of social support was associated with fewer symptoms, with those firefighters who were the most fearful of emotion appearing to gain the greatest benefit from social support (Farnsworth & Sewell, 2011).

As with other first responders, the source of the support may make a difference. Higher levels of family and work support were associated with lower PTSD symptomatology (Corneil et al., 1999) but only perceived support from those outside work was associated with lower PTSD symptomatology, although all forms of perceived support were associated with lower depression symptomatology in Australian firefighters (Regehr, Hill & Glancy, 2000). Japanese firefighters' perceptions of low supervisor support were associated with depressive symptoms (Saijo, Ueno & Hashimoto, 2008). In a mixed responder group of firefighters and paramedics, Beaton et al., (1997) found that although social support received at home was rated more highly in terms of satisfaction, this source of support was not as strongly associated with work-related health.

Support from supervisors predicted a substantially greater amount of variance in stress symptomatology than did support from peers in firefighters (Varvel et al., 2007). The positive impact of a sensitive, empathetic style of leadership noted in police officers (Alexander & Wells, 1991; Alexander, 1993) is demonstrated in a debriefing session for firefighters following the Sioux City aviation disaster, in which a leader broke down in tears while discussing watching a priest delivering the last rites to the people who had died and were still inside the airplane. This permitted the others in the room to share their own feelings, and also to weep (Fullerton et al., 1992). Older colleagues could "shed the load for you" by talking to younger firefighters on return to the station after a call-out (Barnes, 1999, p. 60) and in a study of mixed emergency responders, including firefighters, supervisory support reduced PTSD severity (Ogińska-Bulik, 2013). For UK firefighters unable to access the support of fellow members of their watch because they were not all together until months after the explosion that killed one of their men: "The restoration of the watch then became a prime goal, with a perception that recovery could not occur without this" (Hill & Brunsden 2009, p.83).

Camaraderie described as including "elements of trust, common identity and understanding, along with general positive social bonds" (Tuckey & Hayward, 2011, p.17) was protective against psychological distress and burnout. As emotional demands increased, so did the protective power of camaraderie, with minimal effect when emotional demands were lower, but greater when at their highest. Thus, Tuckey & Hayward describe a culture supportive of camaraderie as "crucial for creating a foundation from which team resilience can grow" (2011, p.17).

This stress-buffering effect was not replicated using a concept of "organisational belongingess" which may differ from camaraderie in being concerned with "organisational-level support and respect" rather than "a construct more akin to peer support" (Armstrong, Shakespeare-Finch & Shochet, 2014 p. 43). In other words, a bond between "comrades" who are "all in it together" versus a sense of belonging to an organisation which provides an organisational identity.

Organizational support may include debriefing (Haslam & Mallon, 2003). Debriefing or defusing was satisfactory to two-thirds of firefighters after the Oklahoma City bombing, with 89% saying they would recommend the intervention to colleagues (North et al., 2002b). Although appreciated, no reduction in stress symptoms following debriefing was reported by police officers (Carlier, Voerman & Gersons, 2000), and no evidence of a significant contribution to either traumatic stress reactions or in coping skills in American firefighters who had received Critical Incident Stress Debriefing (Harris, Baloğlu & Stacks, 2002). Canadian firefighters consistently rated informal discussion as a preferred intervention, but one-to-one debriefing became as popular as informal discussion where the scenarios depicted rose to a level of moderate severity (Jeanette & Scoboria, 2008).

The firefighter "family" is the primary source of social support but there may be "times to go *outside* of the group for help" (Jeanette & Scoboria, 2008, p.323), for example, where the climate in a first responder organisation is not conducive to the sharing of emotion (Evans, Pistrang & Billings, 2013; Haslam & Mallon, 2003). Family and friends are a commonly sought source of support (North et al., 2002b; Haslam & Mallon, 2003). Marital status itself performed a protective function against PTSD in American, but not Canadian firefighters, despite the rate of divorce in the former being nearly twice as high than in the latter (Corneil, et al., 1999). The authors suggested that: "Perhaps an off-shift haven is even more important for a U.S. urban firefighter who is exposed to more frequent traumatic incidents on shift than their Canadian counterparts" (p.140). However, there tends to be a desire not to carry the emotional baggage home, although it is not always easy to avoid (Regehr, 2009) and may suggest that there is "a hidden and sometimes secretive element of firefighting work" (Barnes, 1999, p.59).

As experienced firefighters reported significantly lower support overall than recruits with both social support and length of service predicting depression and traumatic stress symptoms, it may be that support diminishes over time (Regehr, 2009). Conversely, in the aftermath of the 9/11 terrorist attacks, firefighters reported significantly higher perceived social support at work than before (Murphy, Clark Johnson & Beaton, 2004).

Positive emotions

Feelings of exhilaration, of a job well done, appreciation of colleagues and feeling they were able to provide an important and valued service were common in a range of firefighter first responders, body handlers and morticians (Jones, 1985; McCarroll et al., 1993; Moran & Colless, 1995; Moran, 1999). Officers involved in the body handling response after the Piper Alpha oil-rig disaster reported "good morale, organisation and team spirit" (Alexander & Wells, 1991, p.552).

In three recent studies of firefighters, indications of positive growth were identified in Polish, Australian and Israeli firefighters respectively (Ogińska-Bulik, 2013; Armstrong, Shakespeare-Finch & Shochet, 2014; Leykin, Lahad & Bonneh, 2013). In the Polish firefighters this was influenced by peer support; in the Australian firefighters by personal support, described as "self-care coping''; and in the Israeli firefighters by perceived personal strength and appreciation of life.

2.8 Conclusion for prevalence and predictors of PTSD

The current pooled prevalence rate of PTSD in the general population worldwide has been reported as 1.3 – 5%, Berger et al., (2012) and PTSD has a strong comorbidity with other disorders including depression, anxiety and alcohol misuse (Kessler et al., 1995; Breslau et al., 1991; Davidson et al., 1991; Perkonigg et al., 2000; Marshall et al., 2001; Brewin, 2003; Breslau et al., 1991). Prevalence rates of PTSD in firefighters range from 0% (Monteiro et al., 2013) to 57% (Alghamd, Hunt & Thomas, 2013) although lower rates are reported with the most thorough investigation, for example 5% - 8% (Del Ben et al., 2006) and 4.2% to 6.4% (Meyer et al., 2012). As with PTSD prevalence, relatively low rates of clinical depression and anxiety have also found in firefighters. However, alcohol misuse appears possibly a greater cause for concern in firefighters, having a higher prevalence rate than does serious depression and anxiety (e.g. North et al., 2002a; Boxer & Wild, 1993; Meyer et al., 2012; Monteiro et al., 2013). Comparisons of severity of alcohol misuse with firefighters and the general population are complicated by the use of varying instruments and definitions, but hazardous past year drinking was reported in 24.2% of adults in the 2007 UK survey

(Fuller, Jotangia & Farrell, 2009), while problematic past year drinking was reported in 22.5% of American firefighters (Meyer et al., 2012).

Numerous predictors have been identified for PTSD, but lack of social support (Brewin et al., 2000; Ozer et al., 2003) and peritraumatic dissociation (Ozer et al., 2003) are amongst the strongest predictors on meta-analysis and on systematic review, previous psychiatric history remains a strong predictor, and "social ecology" remains under-researched (DiGangi et al., 2013). Previously identified predictors of arousal, hostility, anger, avoidance and rumination are actually symptoms (DiGangi et al., 2013). Similarly, numerous predictors of PTSD have been identified for first responders, and specifically firefighters. There are aspects of their occupation itself which are particular causes of vulnerability towards psychopathological responses such as being younger and single; prior psychological history; threats to safety and sustaining physical injury; negative beliefs about the self and lower self-worth; lower social support; organisational factors; longer experience on the job and multiple exposure; holding a supervisory rank; and not feeling in control (Cook & Mitchell, 2013). Event exposure stressors which appear particularly malign and therefore most in need of emotional neutralisation involve the deaths of children, colleagues and victims with whom the first responder identifies.

The literature reviewed in this chapter suggests that cognitive strategies are used to cope with exposure to PTEs but further investigation was considered necessary to identify underlying mechanisms which might influence the use of such strategies and the extent to which they were adaptive or maladaptive. A review of the literature relating to three cognitive strategies (thought control, counterfactual thinking and humour style) which might operate to cope with exposure is reported in the following chapter and is based on the following premises.

Mental transformation of the dead from human to object (Taylor & Frazer, 1982) and from avoidance of known triggers such as the face or eyes of a deceased victim (Ursano, 1990; McCarroll et al., 1993) is a distraction/avoidance strategy which may supply short-term relief (Taylor & Frazer, 1982), but not necessarily long term (Nydegger, Nydegger & Basile, 2011) and avoidance is associated with later symptomatology in firefighters (Beaton et al., 1999). In order to achieve this transformation, or to decide to avoid triggers, it seems that one's thoughts need to be controlled, and thus thought control is the first cognitive strategy reviewed. Secondly, work event cognitive reappraisal, which includes trying to work out how alternative outcomes could have been achieved, is predictive of PTSD symptomatology in firefighters (Armstrong, Shakespeare-Finch & Shochet, 2014) whilst "acceptance

without judgment" is associated with a decrease in PTSD symptomatology (Chopko & Schwatz, 2013). Avoidance through imagining alternative outcomes is suggestive of thinking contrary to the facts, thus counterfactual thinking is the second cognitive strategy reviewed. Thirdly, positive social support is, in general, predictive of lower symptomatology in the firefighter community (Chamberlin & Green, 2010); Haslam & Mallon, 2003; Regehr et al., 2003; Alghamd, Hunt & Thomas 2013). The essence of social support in firefighters may lie in a combination of camaraderie (Tuckey & Hayward, 2011) and bonding, particularly within the watch system (Hill & Brunsden, 2009) which may be contributed to by the use of particular styles of humour. Humour style is thus the third cognitive strategy reviewed.

Chapter 3 : Cognitive predictors: Thought control, counterfactual thinking and humour style

3.0 Introduction

At the heart of the cognitive model of PTSD (Ehlers & Clark, 2000) lies the intrusions and interpretation of them which form the hallmark of PTSD (e.g. Ehlers & Steil, 1995). Once appraised as stressors, the reoccurrence of intrusions requires the activation of coping/response strategies (Lazarus & Folkman, 1984) which may be maladaptive, and which can occur peri-trauma or post-trauma and may be influenced by pre-trauma factors.

The inherent negativity of PTSD is illustrated by the studies of predictors cited by Di Gangi et al., (2013) and elsewhere in the literature including a coping style with a general negative cognitive bias (Constans et al., 2012); negative affectivity (Rademaker et al., 2011; Weems et al., 2007; Ogińska-Bulik & Langer, 2007); and pre-trauma negative cognitions about self (Bryant & Guthrie, 2005;2007). The latter appear to be particularly psychonoxious, including negative cognitions with relation to self (Dunmore**,** Clark & Ehlers; 1997; 1999; 2001; Clohessy & Ehlers, 1999; O'Donnell et al., 2007; Lancaster, Rodriguez & Weston, 2011; Constans et al., 2012), which may be a marker of differentiation between PTSD and, for example, complicated grief (CG), in which negative self-related attributions were not associated with distress (Golden & Dalgleish, 2012). In DSM-5, symptoms characteristic of trauma/stressor related disorder but which do not meet full criteria for PTSD may constitute "persistent complex bereavement disorder", a condition listed for further study with proposed criteria, p. 520). The lack of association between complicated grief and negative self-related attributions suggests "that the profile of self-processing as a whole in CG is different to that associated with other disorders, in particular MDD and PTSD, in the literature" (Golden & Dalgleish, 2012).

Negativity is also intrinsic in mental defeat (Ehlers, Maercker & Boos, 2000; Dunmore, Clark & Ehlers, 1999); negative appraisal of emotions and symptoms (Ehlers & Steel, 1995; Clohessy & Ehlers, 1999; Dunmore, Clark & Ehlers, 1999; 2001); perceived negative responses from others, permanent change, avoidance/safety behaviours, global beliefs pre and post-traumatic event and change in beliefs (Dunmore, Clark & Ehlers, 1999**;** internal attributions for negative outcomes (Joseph et al., 1991); and attempts to "mentally undo" the traumatic event (Dunmore, Clark & Ehlers, 1999). As

reported by Lancaster et al., (2011), cognitive appraisals predict onset and maintenance of PTSD (Dunmore, Clark & Ehlers, 1997, 1999)

It is, however, arguably tautological to describe predictors of PTSD which are also symptoms, creating a situation "whereby certain dispositions and coping styles place people at risk for developing a condition that, definitionally, involves a negative disposition" (DiGangi et al., 2013, p. 740). Such dispositions or personality traits may influence appraisal of a PTE, for example, those with high levels of negativism (a "negative, dissatisfied, and hostile attitude") may appraise a situation as more alarming than those without, therefore becoming more anxious, and their attitude may also make them less prone to seeking support from others (Bramsen, Dirkzwager & van der Ploeg, 2000, 1116).

The relationship between cognitive schemas and PTSD is bi-directional (Dalgleish & Power, 2004; Power & Dalgleish, 1999; Dekel, Peleg & Solomon, 2013), such that negative post-PTE cognitions may lead to shattered representations (Janoff-Bulman, 1992) which, in turn create symptomatology. In the first long-term longitudinal study of this relationship, Israeli veterans including former prisoners of war were studied in 1991, 2003 and 2008 (Dekel, Peleg & Solomon, 2013). No support was found for post-event negative cognitions' predicting symptomatology, possibly due to methodological issues or the gap of 12 years between the war and assessments; or perhaps this result is suggestive of only a short-term effect of negative cognitions contributing to PTSD. However, PTSD symptomatology was predictive of relatively negative cognitions concerning self and the world ensuing up to 35 years after the war, increasing over time.

Consistent with the metacognitive model (Wells, 2000; Roussis & Wells, 2006), whilst maladaptive metacognitions or negative thought control strategies contribute to severity of PTS symptomatology and dysfunctional post-PTE thoughts, adaptive strategies achieve the reverse (Bennett, Beck & Clapp, 2006; Watkins, 2008; Shipherd & Salters-Pedneault (2008). It is important to consider what cognitive processes may be adaptive or maladaptive in firefighters and whether they may be mutable, presenting valuable opportunities for potential interventions in individuals who respond to PTEs in maladaptive ways (McNally et al., 2011; Weems et al., 2007; McNally, Bryant & Ehlers, 2003).

A literature review was undertaken into three types of cognitive strategies; thought control, counterfactual thinking and use of humour to investigate the degree to which they were maladaptive or adaptive.

3.1 Thought control: the thought suppression paradigm and potentially traumatic events

According to Salkovskis (1989), "the thought suppression paradigm provides one means of experimentally investigating the maintenance of psychopathological intrusions" (Guthrie & Bryant, 2000, p. 899). The first study on thought suppression (Wegner et al., 1987) "initiated a complete literature and can thus be termed a classic study" (Rassin, 2005, p.37). The paradoxical nature of the paradigm emerged in this study when individuals who had initially focused on the target thought of a white bear (the initial expression group) reported less thoughts of it when subsequently expressing thoughts about a white bear compared to those instructed initially to suppress white-bear thoughts. During suppression attempts, participants reported white bear thoughts more than once per minute (the immediate enhancement effect) which accelerated when permitted to express thoughts (the rebound effect).

The failure to suppress initially and the paradoxical rebound effect have become known as "the white bear effect" (Rassin, 2005, p.2). Thought suppression involves both consciously trying to think of something other than the target thought and an ironic, unconscious monitoring process which is on guard for unwanted intrusions (Rassin, Merckelbach & Muris, 2000). The ironic process theory (e.g. Wegner, 1994) is described as "the most complete account for suppression-related phenomena" (Wenzlaff & Wegner, 2000, p. 68). In their review of the literature, Wenzlaff & Wegner (2000) identify studies in which the rebound effect has been replicated (e.g. Harvey & Bryant, 1998b; Wegner et al., 1991; Wegner & Gold, 1995), sometimes only partially (Kelly & Kahn, 1994); or not replicated (Merckelbach et al., 1991; Muris et al., 1992; Roemer & Borkovec, 1994).

3.1.1 The nature of the target thought

An emotional reaction to a thought would impair one's ability to suppress it (Rachman, 1982) and suppression of thoughts related to the experience of a traumatic event was associated with increased illness and subjective distress (Pennebaker, 1989), whilst the motivation to suppress thoughts may depend on the nature of the emotionally relevant material (Salkovskis & Campbell, 1994). All things considered, it is more difficult to suppress emotional than neutral material (Wenzlaff & Wegner, 2000).

The rebound effect occurred following the viewing of a genuine distressing film, but not for one showing polar bears (Davies & Clark, 1998); and the rebound effect was greater when evidence in a mock trial was presented in an emotionally charged manner than a purely legalistic one, after jurors had been instructed to disregard the evidence (Edwards & Bryan, 1997). Depressive thoughts evoked

increased depression, but anxious or neutral thoughts did not (Roemer & Borkovec, 1994). Some studies showed that no rebound effect was found when thoughts were negative, but not personally relevant (Muris et al., 1992; Harvey & Bryant, 1998a) and it may be more difficult to suppress personally relevant negative thoughts (McNally & Ricciardi, 1996; Trinder & Salkovskis, 1994). Difficulty has been experienced in suppressing all personal intrusive thoughts (Salkovskis & Campbell, 1994). Naturally occurring thoughts may be more easily suppressed (Wenzlaff & Wegner, 2000; Kelly & Kahn, 1994). For example, it may be natural to think about a relationship which is still desired (hot flames) explaining why those attempting to suppress thoughts of such a relationship showed no cognitive rebound effect on expression, but there is no need to think about a no longer desired relationship (cold flames), so when trying to suppress thoughts of one, a cognitive rebound effect did occur (Wegner & Gold, 1995).

In a meta-analysis, personal relevance and valence had no effect on rebound effects; rather, the target was associated with rebound when it was a non-discrete thought such as a story, rather than a discrete one such as a white bear (Abramowitz, Tolin & Street, 2001). Notably, across the 28 studies reviewed, longer suppression periods were related to larger initial enhancement effects, indicating that although potentially successful in the short term, suppression may not be so long-term. Brewin & Smart (2005**)** suggested that differences in the ability to prevent personally relevant intrusions from reaching consciousness may indicate a form of resilience.

3.1.2 Psychopathology and thought suppression

Purdon (1999, p. 1049) states that "the results of studies investigating the effects of thought suppression on frequency of neutral and clinically relevant thoughts have been vastly inconsistent" although she concluded that thought suppression does appear to have a negative impact in depression, posttraumatic stress disorder and obsessive compulsive disorder. Thought suppression is an avoidance strategy and therefore at the heart of the DSM-IV diagnosis of PTSD and of the cognitive model (Ehlers & Clark, 2000) suggesting that it is inherently maladaptive. The metacognitive model (Wells, 2000) suggests that emotional processing can be derailed by this and other threat monitoring strategies (Roussis & Wells, 2006). Researchers have deemed it to be a risk factor (e.g. Shipherd & Salters-Pedneault, 2008).

According to Beck et al., (2006), just four studies had been published with traumatised individuals (Harvey & Bryant, 1998b; Guthrie & Bryant (2000); and Shipherd & Beck, 1999; 2005) with inconsistent results. Both ASD and non-ASD participant suppressors reported significantly greater rebound effects than non-suppressors (Harvey & Bryant, 1998b). Victims of sexual assault with PTSD experienced more rebound intrusions of the event than those without PTSD (Shipherd & Beck,

1999). Replicating this, survivors of road traffic collisions (RTCs) with PTSD experienced more rebound effect than those without PTSD when the suppressed thought was related to the trauma, but where it was neutral PTSD participants did not experience a rebound effect (Shipherd & Beck (2005). These results were not replicated in ASD patients when the thought suppression period was over 24 hours rather than for less than ten minutes, with no rebound effect for trauma-related thoughts (Guthrie & Bryant, 2000). Nor was it replicated in survivors of RTCs where both PTSD and non-PTSD participants reported a rebound in trauma related thoughts, although the PTSD group reported higher distress (Beck et al., 2006). Shipherd & Beck's (2005) study was replicated insofar as the rebound effect occurred at a higher rate for traumatic target thoughts than neutral ones in PTSD participants whilst non-PTSD participants experienced a decline in traumatic target thoughts (Amstadter & Vernon, 2006). The majority of studies (26/28) have been carried out using analogue samples but those with clinical diagnoses did not show larger rebound effects than the analogue or nonclinical studies (Abramowitz, Tolin & Street, 2001).

Measured as a coping style, thought suppression was significantly correlated with higher scores on the intrusion and avoidance subscales of the IES (Amir et al., 1997) and was associated with avoidant behaviour and associated with posttraumatic stress symptomatology after controlling for levels of exposure after the 2004 Madrid terrorist attack (Vázquez, Hervás & Pérez-Sales, 2008). Higher levels of thought suppression were associated with PTSD, although the strongest predictor in the study was level of depression (Cameron, Palm & Follette, 2010) and high PTSD individuals exposed to civil war failed to suppress death-related thoughts when primed by thoughts of their own possible deaths during the war, whereas low PTSD individuals succeeded (Chatard et al., 2012). Thought suppression made a unique contribution to variance in predicting the severity of PTSS symptomatology in victims of interpersonal trauma (Valdez & Lilly, 2012).

Evidence suggests that suppression is not necessarily maladaptive. In an experimental analogue study, conceptual processing (elaboration on the meaning of the film) did not produce less symptomatology of PTSD than did suppression (Buck, Kindt & van den Hout**,** 2009) suggesting that avoidance through suppression is not necessarily maladaptive, but may depend more on negative interpretation of symptomatology or a belief that suppression is dysfunctional. Rassin, Merckelbach & Muris (2000**,** p. 984) cast doubt on thought suppression as "an important antecedent to the radicalization of PTSD symptoms" (as is implied by the studies of, e.g., Shipherd & Beck, 1999; Harvey & Bryant, 1998b; Amir et al., 1997). According to Rassin, Merckelbach & Muris (2000) the findings that intrusion precede avoidance on longitudinal study (Creamer, Burgess & Pattison ,1992; Cella et al., 1988) are consistent with the structure of PTSD symptoms (Foa, Riggs & Gershuny, 1995).

Indeed, greater frequency of intrusions may arise through a low level of thought suppression, according to Hoping & de Jong-Meyer (2003). They reported that the thought suppression sub-factor of the White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994) was weaker than that of unwanted intrusive thoughts, showing small associations with psychopathology. Direct suppression may control unwanted intrusions, as indicated in a modified version of the Think/No Think paradigm (TNT; Anderson & Green, 2001). Participants studied images of unpleasant scenes together with an image designed as a cue for recall of the scene and were then instructed either to recall that scene in as much detail as they could (think) or to try to suppress it by focusing only on the cue and not thinking of the associated scene (no think). In the no-think condition, direct suppression reduced recall probability and detail in remembered images, including central details (Kupper et al., 2014).

In respect of other disorders, depressed people have been shown to have more difficulty suppressing depressing thoughts than non-depressed people, distracting themselves by focusing on other negative material (Wenzlaff, Wegner & Roper, 1988), and dysphoric individuals suppressing a negative memory similarly can more easily and rapidly then access other negative memories than non-dysphorics (Dalgleish & Yiend, 2006). Generalised Anxiety Disorder patients suffered more intrusions of their main worry than of white bears, whereas the reverse was found in non-anxious controls and those with speech phobia (Becker, et al., 1998). Attempting to suppress an urge for alcohol in heavy social drinkers resulted in faster endorsement of alcohol outcome expectancies than those who had not previously suppressed, suggesting that attempting to suppress the urge may lead to an increase in drinking (Palfai et al., 1997). Thought suppression is associated with psychopathology, in particular, depression, anxiety and paranoia (Spinhoven & van der Does, 1999).

3.1.3 Thought control strategies

Attempted thought suppression is carried out in order not to think about a particular thought and is therefore a goal. The Thought Control Questionnaire (TCQ; Wells & Davis, 1994) was developed to measure differences between the strategies individuals might use to achieve that goal. These strategies are described as subscales of worry, distraction, punishment, reappraisal and social control. The psychometric properties of the TCQ are discussed in Chapter 4, and associations between the subscales and psychopathological responses are reviewed in this chapter. The relevance of the TCQ subscales to firefighters' responses to PTEs is indicated by strategies identified in the first responder literature to control intrusive thoughts and images which include suppression (Moran & Colless, 1995); reappraisal (Armstrong, Shakespeare-Finch & Shochet, 2014; Chang et al., 2003); avoidance generally (Barnes, 1999; Ursano, McCarroll & Fullerton, 2007; McCarroll et al., 1993; Avsec, Novake & Bajec, 2012; Nydegger, Nydegger & Basile, 2011); and a form of "cognitive

shifting", such as imagining that a stressor is something else (Taylor & Frazer, 1982; Pitman, 1993), a technique which has been described as successful in decreasing distress, but the mechanics behind it have not been tested (Taylor & Frazer, 1982).

3.1.4 The TCQ subscales and psychopathology

Distraction

Distraction requires attempting to replace an unwanted cognition with an alternative thought or behaviour, as denoted by TCQ items such as "I think pleasant thoughts instead" or "I occupy myself with work instead" and appeared to be neither adaptive nor maladaptive as a thought control strategy.

Distraction may be a maladaptive strategy, associated with the immediate enhancement effect and the rebound effect even after controlling for PTSD symptoms (Shipherd, Tanner & Beck, 2007). Greater use of distraction is associated with greater symptomatology of ASD and the number of trauma-related thoughts (Guthrie & Bryant, 2000); and with greater symptomatology of PTSD (Scarpa et al., 2009). Greater use of distraction is associated with more post-stressor repetitive negative thinking, which correlates with anxiety and depression (McEvoy, Mahoney & Moulds, 2010; McEvoy, Moulds & Mahoney, 2013).

Distraction has also been found to be adaptive, being negatively associated with ASD and PTSD caseness (Holeva, Tarrier & Wells, 2001**)** and with lower levels of PTSD and of dysfunctional trauma cognitions (about the world, self and self-blame), with distraction partially intervening in the relationship between PTSD and these cognitions (Bennett, Beck & Clapp, 2009). Distraction negatively correlated with anxiety and depression in PTSD and depressed patients (Reynolds & Wells, 1999). GAD patients used distraction less than controls (Wells & Carter, 2009; Coles & Heimberg, 2005) and its use was associated with lower levels of depression and worry (Coles & Heimberg, 2005). Although OCD patients used distraction less frequently than non-anxious controls, this strategy was unconnected with psychopathology (Amir, Cashman & Foa (1997) whereas in OCD patients also using distraction less than controls, lower symptomatology was reported (Abramowitz et al., 2003).

Finally, supporting Wells & Davies (1994), no significant association was found between successful avoidance of unwanted thoughts and the distraction subscale (Andrews et al., 2002).

Worry

Worry is a feature of anxiety disorders and is a core feature of Generalised Anxiety Disorder (Olatunji et al., 2010) and Obsessive Compulsive Disorder, but also occurs in healthy individuals (Wells & Papageorgiou, 1998; Salkovskis & Harrison, 1984). Obsessive rumination focuses on the processing characteristics of obsessive thoughts and is the largest single predictor of worry (van Rijsoort, Emmelkampf & Vervaeke, 2001). Rumination has been extensively researched (McEvoy, Mahoney & Moulds, 2010), but differs from worry in that it is rooted in the past, whereas worry is concerned with the future. Both, however, are forms of repetitive negative thinking (RNT) which appear to be transdiagnostic (McEvoy, Moulds & Mahoney, 2013).

Greater use of worry correlates with greater stress symptoms (Roussis & Wells, 2006); with anxiety in depressed patients (Reynolds & Wells, 1999); with severity of intrusive, avoidance, arousal and depressive symptoms (Warda & Bryant, 1998); with greater levels of PTSD (Scarpa et al., 2009) and dysfunctional trauma cognitions, and worry was positively associated with greater PTSS severity (Valdez & Lilly, 2012; Bennett, Beck & Clapp), with ASD symptomatology, anxiety and suppression ratings (Guthrie & Bryant, 2000), and predicts both ASD and PTSD caseness (Holeva, Tarrier & Wells, 2001).

ASD patients used worry more than controls (Warda & Bryant, 1998) and less use of worry correlates with reduced PTS and anxiety symptoms in ASD sufferers after treatment (Bryant, Moulds & Guthrie, 2001). Patients suffering from GAD and MDD used the worry strategy more than did controls (Wells & Carter, 2009) and GAD patients used worry more than controls, a strategy also associated with symptomatology of depression (Coles & Heimberg, 2005). OCD patients used worry more than controls (Amir, Cashman & Foa, 1997; Abramowitz et al., 2003) and greater use was associated with higher levels of obsessional symptomatology (Abramowitz et al., 2003).

Greater use of worry is associated with more repetitive negative thinking both pre and post- stressor (McEvoy, Mahoney & Moulds, 2010; McEvoy, Moulds & Mahoney, 2013) and with the inability to control unwanted thoughts (Andrews et al., 2002**;** Luciano et al., 2005; Williams et al., 2010; Valdez & Lilly, 2012).

Punishment

Self-punishment is a “naturalistic technique that individuals use to suppress unwanted thoughts” (Wells & Davies, 1994, p. 875), a strategy “in which the individual blames himself for the thought” which “preserve[s] mistaken interpretation and distress associated with intrusive thoughts” (Abramowitz et al., 2003, p. 537). As with worry, greater use of punishment correlates with stress

symptoms (Roussis & Wells, 2006); is associated with greater severity of ASD symptoms, ratings of anxiety, thought frequency and attempted suppression (Guthrie & Bryant, 2000) and predicts ASD and PTSD caseness (Holeva, Tarrier & Wells, 2001). Increased PTSD severity was associated with increased use of punishment (Bennett, Beck & Clapp, 2009; Scarpa et al., 2009; Valdez & Lilly, 2012). Punishment is associated with increased severity of intrusive, avoidance, arousal and depressive symptoms (Warda & Bryant, 1998) and predicts depression and intrusions in the depressed group (Reynolds & Wells, 1999).

GAD patients used the punishment strategy more than controls (Wells & Carter, 2009; Coles & Heimberg, 2005) and its use was associated with symptomatology of depression (Coles & Heimberg, 2005); ASD patients used it more than controls (Warda & Bryant, 1998; Guthrie & Bryant, 2000) as did OCD patients (Amir, Cashman & Foa (1997; Abramowitz et al., 2003) and it's greater use was associated with higher levels of obsessional symptomatology, whilst lower use of punishment in those who responded to treatment was associated with less obsessional symptomatology (Abramowitz et al., 2003). Punishment is the greatest discriminator between OCD patients and people without anxiety disorders (Abramowitz et al., 2003).

Greater use of punishment is associated with more repetitive negative thinking both pre and post-stressor (McEvoy, Mahoney & Moulds, 2010; McEvoy, Moulds & Mahoney, 2013) and with the inability to control unwanted thoughts (Andrews et al., 2002**;** Luciano et al., 2005; Williams et al., 2010; Valdez & Lilly, 2012). Both worry and punishment were associated with emotional vulnerability and psychopathology during developmental testing of the TCQ (Wells & Davies, 1994) and both were associated with attempted avoidance, which is also associated with psychopathology (Andrews et al., 2002).

Social control

Social control encompasses seeking communication with others about the thought and is generally seen as positive. For example, social control is associated with successful suppression and an absence of rebound effect (Shipherd, Tanner & Beck, 2007) and negatively correlates with stress symptoms (Roussis & Wells, 2006). Greater use of this strategy is also associated with lower levels of PTSD and is negatively associated with dysfunctional cognitions (Bennett, Beck & Clapp, 2009); and with lower levels of trauma symptoms, mediating the relationship between child sexual abuse severity and both IES total scores and those on the avoidance subscale (Scarpa et al., 2009). Use of social control strategies reduced PTS, anxiety and depression symptomatology in ASD patients after treatment (Bryant, Moulds & Guthrie, 2001) and is negatively associated with severity of ASD symptomatology and ratings of anxiety (Guthrie & Bryant, 2000).

Social control was negatively associated with avoidance in depression and PTSD groups suggesting that discussing unwanted thoughts may be helpful in reducing avoidance and arousal in both depression and PTSD (Reynolds & Wells, 1999) and was inversely associated with successful avoidance suggesting that it might be maladaptive in the long term (Andrews et al., 2002). Social control was negatively associated with ASD and PTSD caseness, however, the combination of high use of social control and high perception of negative social support greatly increased the likelihood of developing PTSD in comparison with other combinations of those variables (Holeva, Tarrier & Wells, 2001).

Controls without a diagnosis used social control more than patients suffering from GAD and MDD (Wells & Carter, 2009) and GAD patients used social control less than non-anxious controls, a strategy also negatively associated with symptomatology of depression (Coles & Heimberg, 2005). In ASD patients, it was negatively associated with depression, anxiety and intrusion (Warda & Bryant, 1998). Both people with OCD and anxious controls used social control as a preferred thought control strategy less frequently than non-anxious controls for whom it was the most prevalent strategy together with distraction (Abramowitz et al., 2003) but people with OCD used it more than non-patients in another study (Amir**,** Cashman & Foa, 1997).

In three studies, social control was not associated with perceived ability to control unwanted thoughts (Luciano et al., 2005; Williams et al., 2010; Valdez & Lilly, 2012).

Reappraisal

Wells & Davies (1994) recognised that reappraisal can be negative and positive. Items on the TCQ (e.g. 'I try to reinterpret the thought' and 'I try a different way of thinking about it' may be adaptive or maladaptive, as is illustrated by the inconsistency in studies. Reappraisal was not associated with PTSD severity, nor was there any relationship between PTSD and dysfunctional cognitions (Bennett, Beck & Clapp, 2009)**,** and along with the other subscales, did not independently predicted intrusions in the PTSD group (Reynolds & Wells, 1999). The reappraisal scale was not associated with psychopathology in GAD patients, leading the authors to suggest that its utility as a measure could be called into question (Coles & Heimberg, 2005).

Reappraisal was negatively correlated with stress symptoms (Roussis & Wells, 2006) and decreased depression scores in ASD sufferers after treatment (Bryant, Moulds & Guthrie, 2001). Reappraisal was negatively associated with the Beck Depression Inventory (BDI; Beck et al., 1961) and the IES intrusion scale for the depressed group only, which could be because it reduced depression and intrusions, or depression may be associated with decreased utility or a different type of reappraisal

(Reynolds & Wells, 1999). However, reappraisal was positively associated with depression in ASD patients, (Warda & Bryant, 1998) and with greater PTSD symptomatology (Scarpa et al., 2009; Valdez & Lilly, 2012); and reappraisal had a relatively small effect on psychopathology of anxiety, depression, eating and substance-related disorders (Aldao, Nolen-Hoeksema & Schweizer, 2010).

Valdez & Lilly (2012) found that the reappraisal scale correlated positively with all other scales on the TCQ so that the scale may encompass both positive and negative thought control strategies and the authors suggested that the reappraisal scale may thus require reconsideration. The reappraisal items can be interpreted positively or negatively e.g. "I focus on the thought" and "I question the reasons for having the thought". "I try to reinterpret the thought" and "I try a different way of thinking about it". Perceived ability to control unwanted thoughts was negatively associated with increased use of reappraisal (Luciano et al., 2005; Valdez & Lilly, 2012).

Summary

The literature indicates that distraction may be adaptive, maladaptive or neutral; worry and punishment are maladaptive; social control is generally adaptive; and reappraisal can be both adaptive and maladaptive.

3.2 Counterfactual thinking and potentially traumatic events

Counterfactual means "contrary to the facts" (Roese, 1997, p.133) following Kahneman & Miller (1986) and Kahneman & Tversky (1982). The process of thinking counterfactually involves attempting to "undo" an outcome by finding an element in an action or inaction which could be removed or changed. Counterfactuals more commonly arise following the experience of negative events in imagining how the outcome could have been better than reality (Epstude & Roese, 2008). It was hypothesised that such thinking might arise in firefighters in circumstances where a rescue/recovery attempt did not have the desired outcome.

The literature has ranged widely in focus, embracing, inter alia, the effect of counterfactuals on decision making under uncertainty (Kahneman & Tversky, 1982a); decision making in mild or moderately depressed individuals with fragile self- esteem (Howlett & Paulus, 2013); missing flights by a long way or by the skin of the teeth (Tykocinski & Steinberg, 2005); improving performance on examinations (Nasco & Marsh, 1999); athletes' management of defeat (Uphill & Dray, 2009); levels of commitment to a current partner when past alternatives may have been possible and led to greater happiness (Petrocelli et al., 2015); motivation **(**McMullen & Markman, 2000); the construction of alternative selves (Insead, 2012); defensive pessimism and optimism (Sanna, 1996); need for cognition and punitive responses to crime (Petrocelli & Dowd, 2009); the temporal order of

events and the assignation of blame (Miller & Gunasegaram, 1990); and counterfactual emotions and choice in gambling experiments (Levens et al., 2014).

Nearly forty years have passed since Janet (1976, p.302) described psychasthenic (OCD) patients who "do not live in the present, but are always busy rearranging in their imagination the facts of the past" (cited by Pitman, 1993, p. 105). As Pitman points out, this aptly describes PTSD, but it also seems a fitting description of counterfactual thinking. However, very little research has been carried out into potential associations between counterfactual thinking and psychopathological responses (Dalgleish, 2004; Gilbar, Plivazky & Gil, 2010). By the time of Dalgleish's (2004) study, the content of counterfactual thinking in persons exposed to PTEs, or potential associations between the style and posttraumatic stress responses had not been directly investigated, and only four studies had done so indirectly (Davis et al., 1995; Dunmore et al., 1999, 2001), despite the recognition as "what if …" thoughts in the cognitive model of PTSD (Ehlers & Clark, 2000).

3.2.1 Overview of counterfactual thinking

As Roese (1994) describes it, some conditional thoughts contain an antecedent (e.g. "if only...") followed by a consequent ("then …"). These types of counterfactual thoughts, where the imagined outcome would have been preferred to the actual one, are referred to as "upward", whereas antecedents such as "even if" followed by "then …" are "downward" counterfactuals, whose outcome would have been worse than the reality. The functional basis of counterfactual thinking describes the effect of upward counterfactual thinking as intensifying negative emotional responses while downward intensify positive and diminish negative emotions (Roese, 1994). The immediate effect may differ, with upward counterfactuals which improve on reality and help to prepare for the future, being associated with immediate dissatisfaction, and downward counterfactuals, which worsen reality and do not assist with preparation, providing immediate satisfaction (Markman et al., 1993). Upward counterfactuals may also have a protective, buffering function so that the thinker can prepare for the worst which permits them, if an unwanted outcome does come to pass, to think that they knew that it would (Sanna & Meier, 2000; Sanna, 2000).

McMullen & Markman, (2000) suggest that it is possible for downward counterfactuals to motivate individuals provided that they first produce negative affect, since their participants wanted to withdraw money they had invested when they felt bad about that investment, and students who felt bad when thinking about the grades they had achieved felt that they should work harder. For counterfactual thinking to be adaptive, there must be an ability to inhibit these thoughts when there really is nothing that one could do (Roese, 1997; Roese & Olsen, 1997; Tykocinski & Steinberg, 2005), which is more likely to happen when the events in question were uncontrollable than controllable

(Tykocinski & Steinberg, 2005). This type of thinking serves as a "kind of silver lining" (Anderson, Kay, & Fitzsimons, 2013, p.16).

Counterfactual thinking may have the benefit of increasing a sense of meaning in life. In one study, participants were asked to think about how things could have turned out differently had they chosen a different college to the one they attended; not met the partner they currently had; and not experienced a turning point they identified in their life. The effect of thinking about these events not happening led them to generate feelings that the current reality was a product of fate, rendering it more meaningful (Kray et al., 2010). Similarly, survivors of the tsunami in Southeast Asia generated ten times more downward than upward counterfactuals, and two years later, 95% felt they had been lucky, perhaps because they had survived and many others had not (Teigen & Jensen, 2011). This trade-off (Markman et al., 1993) indicates that upward and downward counterfactuals lead to consequences in a similar manner to social comparison, where upward comparison of oneself with others who are better or worse off than ourselves can be both negative and positive (Roese, 1997) depending upon whether you identify or contrast yourself with those comparisons (Buunk et al., 2001).

Counterfactuals can also be delineated by their focus: additive counterfactuals add antecedents and subtractive ones remove them, (Roese, 1994), the difference being illustrated by "if only I had …" versus "if only I hadn't …" Additive counterfactuals tend to arise after failure and subtractive after success (Roese & Olson, 1993a; 1993b) such that the former are more preparative in function, focusing on one particular option that could have been taken and would have produced a better outcome, whereas subtractive counterfactuals only remove one possible option. Perceiving oneself as being close to a desired outcome can result in poorer mood. Silver medallists focused on the fact that they had nearly achieved their goal of a gold medal, but had failed (upward), whilst bronze medallists focused on the fact that they had at least won a medal (downward). For the silver medallists, coming so close to gold, even though they were objectively better off than the bronze medallists, activated the pain of having almost made it, explaining why bronze medallists tended to be happier (Medvec, Madey & Gilovich, 1995).

Mutability of an outcome is perceived to be greater for the first event in a causal chain (Wells, Taylor & Turtle, 1987) and the final where the sequence is temporal (Miller & Gunasegaram, 1990). Where the sequence of events which precedes an unwanted outcome cannot be changed, people are less likely to engage in counterfactual thinking (Kahneman & Miller, 1986). If the sequence was abnormal, counterfactual thinking is more likely (Kahneman & Tversky, 1982) as shown in scenario-based rape situations (Turley, Sanna & Reiter, 1995). However, when the traumatic event involved

the actual death of a loved one, only 28% of bereaved individuals reported trying to undo an exceptional event in the sequence preceding an RTC, with 68% attempting to undo usual activities, with no differences in distress sustained (Davis et al., 1995).

In non-pathological counterfactual thinking, repeatedly focusing on past events through counterfactuals may be healthy. When simulations of autobiographical events were repeated, participants rated them as less plausible, but more detailed, more easily simulated and more positive than those simulated once only, irrespective of whether the counterfactuals were upward, downward or neutral (De Brigard, Szpunar & Schacter, 2013). Intriguingly, downward counterfactual thinking about pivotal events in life evoked more meaning than just thinking about the events, and did so when the reality was perceived as fated, suggesting that these "musings anchor reality with a sense of destiny" (Kray et al., 2010, p. 115).

Emotions associated with counterfactual thinking may be negative, including regret and self-blame (Boninger, Gleicher & Strathman, 1994; Miller et al., 2010) or positive, such as relief (Kahneman & Miller, 1986). Greater regret was found for action taken rather than inaction, when the outcome was unwanted, perhaps because inaction is the norm and anything deviating from it is more likely to be regretted (Kahneman & Tversky, 1982a). But in the long-term, inaction led to greater regret, whereas in the short-term, action did so (Gilovich & Medvec, 1995), and regret over omissions may be more self-enhancing than over commissions in individuals with high self-esteem (Feeney et al., 2005). When comparing previous episodes involving shame, people tended to try and undo aspects of self, but when the episodes involved guilt, tried instead to undo aspects of their behaviour. When directed to produce counterfactuals about self, they experienced more feelings of shame than of guilt and when producing counterfactuals about their behaviour, they experienced more feelings of guilt (Niedenthal, Tangney & Gavanski, 1994). Particularly for those prone to accept self-blame for negative outcomes, less regret and self-blame may be achieved through directing a counterfactual forwards to what might be done in the future, rather to than to the past (Boninger, Gleicher & Strathman, 1994).

The greatest lifetime regret was felt failing to gain educational or academic qualifications, followed by choice of occupation, and higher depression was associated with disappointment at not having pursued the regretted course (Lecci, Okun & Karoly, (1994), thus indicating the presence of a possible psychopathological relationship. However, individuals with mild depression experienced greater regret than non-depressed individuals after making a decision once they were given a previously unknown alternative, regardless of their original decision and whether the new alternative would have been better and causal modelling analysis revealed that depression

independently predicted regret (Monroe et al.,2005) . High negative emotional intensity was associated with upward counterfactuals and lower negative intensity with downward (Allen, Greenlees & Jones, 2014). In some scenario-based research, it is the negative outcome which prompts the generation of more counterfactuals (e.g., Landman, 1987; Gavanski & Wells, 1989) but in a gambling experiment, Markman et al., (1993) did not find this to be so. Although there may have been a tendency pre-trauma to generate them, both upward and downward counterfactuals were reported in the aftermath of the Columbine shooting massacre, and these thoughts were themselves considered to be a source of emotional upset, dominating ruminations (Hawkins et al., 2007).

Personality was suggested by Roese (1994) to be associated with more emotional response to some types of counterfactuals. One recent study has shown that extraversion, neuroticism and openness and counterfactuals were independently associated with negative emotions (Allen, Greenlees & Jones, 2014). The authors state "In short, our findings suggest that people who are more introverted, disagreeable, emotionally unstable, and/or less open to new experiences tend to respond to negative outcomes with a greater number of negative emotions that are more intense and of a longer duration" (p. 153).

In summary, upward counterfactuals may function in a positive preparatory way (Markman & Miller, 2006; Nasco & Marsh, 1999; Roese, 1994; Taylor & Schneider, 1989), enhancing affect (e.g. Roese, 1994), and counterfactuals after a negative experience may be designed to find meaning and prepare for the future (Taylor & Schneider, 1989) and thus could be seen as a coping mechanism. Repeatedly focusing on past events may be healthy (De Brigard, Szpunar & Schacter, 2013) and downward counterfactuals generate more meaning about turning points in life than focusing on the event itself (Kray et al., 2010). It may be that is more helpful to consider when and for whom upward counterfactuals are functional (Markman & Miller, 2006). Counterfactuals may also be dysfunctional, engendering negative affect including regret and self-blame (Boninger, Gleicher & Strathman, 1994; Branscombe et al., 2003; Davis et al., 1996). The direction may not always be the same, as evidence suggests that counterfactuals are created by mood as well as vice versa, so that manipulated bad moods induced upward counterfactuals and manipulated good moods induced downward counterfactual thinking (Sanna, 2000).

3.2.2 Counterfactual thinking and psychopathology

Roese (1997) states that, as counterfactual thinking is necessary for healthy functioning, long-term emotional dysfunction is suggestive of a breakdown of the system. It appears that upward counterfactuals (which produce a better alternative to the actual, undesired outcome) tend to lead to greater psychological distress; Roese, 1997; Gilovich & Medvec, 1995), and this may include

depression and anxiety. In breast cancer patients, higher use of upward counterfactuals was associated with a high level of psychological distress, although downward counterfactuals were not related to lower distress (Gilbar & Hevroni, 2007). In women who had experienced recurrent miscarriage, the most commonly generated counterfactuals were upward, self-referent, which were associated with anxiety, but not depression. More uncontrollable, more self-focused and less reasonable counterfactuals were used more by those with severe depression symptomatology and were dysfunctional (Markman & Miller, 2006) and depressed people were not helped by upward counterfactuals in preparing for the future (Quelhas et al., 2008). Nor were non-specific counterfactuals helpful, despite being controllable, in individuals whose perfectionism is maladaptive in nature, perhaps because these non-specific counterfactuals do not contain the "necessary elements that can help initiate behaviour change" (Sirois, Monforton & Simpson, 2010, p. 1689). However, the duration of counterfactual thinking was associated positively with both anxiety and depression (Callander et al., 2007). Howlett & Paulhus (2013) proposed a model incorporating fragile self-esteem with counterfactual thinking in depressed individuals. In the aftermath of an unwanted outcome brought about by their decision, both depressed and non-depressed individuals may generate self-referent counterfactuals and so will feel regret, but the regret felt by depressed individuals will be greater because of their lower self-esteem (Howlett & Paulhus, 2013).

Roese (1994, p. 816) pointed out that the "endless replaying of past failures, reconstructed ad nauseam with only minor alterations, might represent a counterfactual mechanism that promulgates depressive states." Following a national survey of Americans, Roese et al., (2009) reported that regret and repetitive thinking were associated with distress, but repetitive thinking was not associated with depression and anxiety symptomatology. Put together, "repetitive regret" predicted general distress but not symptomatology. They concluded that "regret seems to be a key ingredient that amplifies the connection between repetitive thought and general distress" (Roese et al., 2009, p.685).

Research on associations between counterfactual thinking and PTSD responses is surprisingly limited (Dalgleish, 2004). He cited four relevant studies, the first two carried out with the bereaved following PTEs, and these indirectly examined post-traumatic responses, suggesting that upward counterfactuals were associated with increased distress. Where loved ones had been killed in RTCs, 80% of bereaved individuals reported ruminations of the accident and of these, 56% spontaneously reported counterfactual thinking. Either their thinking concerned changing their own behaviour (self-referent counterfactuals) or that of the deceased, but no participant tried mentally to change the behaviour of the other driver involved. On being asked directly whether they had experienced

"if only" thoughts, 58% reported that they had, and 48% still experienced such thoughts 4-7 years later (Davis et al., 1995). Participants who were still generating counterfactual thoughts reported more psychological distress than those who had in the past and those who never engaged in counterfactual thinking. General ruminations were not associated with distress when controlling for counterfactuals, suggesting that there is an association between counterfactuals and distress distinct from that in rumination generally (Davis et al., 1995). Similarly, 76% of bereaved parents of children who had died of SIDS had generated counterfactual thoughts of the death three weeks later, 42% were still doing so at 18 months post-death; and the counterfactuals were nearly always self-referent, despite the fact that SIDS has no known cause. The greater the number of counterfactuals, the greater distress was reported (Davis et al., 1995).

The second two studies referred to by Dalgleish (2004) reported together that "undoing" was not independently associated with persistence of PTSD symptomatology. In the first, although frequency of undoing was associated with the onset of PTSD, it was not associated with maintenance, and did not explain PTSD variance when previous history/severity of symptoms was controlled for (Dunmore et al., 1999). In a longitudinal analysis, undoing was related to PTSD severity at one follow-up point, but did not explain variance in PTSD severity on regression when controlling for gender/previous history/severity of symptoms (Dunmore et al., 2001).

Dalgeish (2004) carried out the first direct examination of counterfactuals, including their direction. Most survivors of a Criterion A PTE (79%) reported self-related counterfactuals and 87% were upwards in direction but there was no association between the thoughts and posttraumatic stress symptomatology. Had these survivors been at fault, the direction of their counterfactuals might have been influenced by that knowledge, but on replication in the second study with those who attributed fault elsewhere and did not hold primary liability, survivors still tended towards self-referent upward counterfactual generation, whether or not they were PTSD positive or negative. Again, no relationship was found between the content of their thinking and posttraumatic stress (Dalgleish, 2004). In the third study, individuals having experienced a traumatic event perceived as uncontrollable by them were compared with controls in two hypothetical scenario conditions. They were more likely to generate self-referent counterfactuals when that scenario was uncontrollable than those who had not been involved in a traumatic event. Where the situation was controllable, no differences were found. Thus, self-referent counterfactuals did generalise from an experienced traumatic event to a negative event not personally experienced, but the direction did not, which Dalgleish (2004) suggests is because they code for self-efficacy or controllability. A final study

demonstrated that the results were unlikely to have been affected by priming of memories (Dalgleish, 2004).

Taken together, the results of these studies indicate that those exposed to a Criterion A event generated self-referent upward counterfactual thinking regarding that event, even when they held no blame for it. This tendency in those exposed to a Criterion A event coloured their thinking with regard to non-autobiographical, uncontrollable events, but was not present in non-exposed individuals, suggesting that it is exposure which has the effect on the creation of these counterfactuals. No such thinking, however, was associated with distress (studies 1 and 3) or PTSD caseness (2).

In survivors of physical assault, counterfactual frequency was associated with PTSD symptomatology, diminishing over time since the assault. Counterfactual fluency (the availability of relevant counterfactuals) was not associated with PTSD, but rather the generation of behavioural plans, which was a constructive outcome of counterfactual thinking. Neither upward nor downward counterfactuals were associated with symptomatology (El Leithy, Brown & Robbins, 2006). Some studies have found associations between counterfactual cognitions and PTSD. Cognitions described as “wishful thinking” or “denial by fantasy” were associated with greater PTSD severity three months after an assault **(**Valentiner et al., 1996). In a sample of Israelis who had sustained physical injury in terror attacks, those diagnosed with PTSD used more upward counterfactual thinking than those not diagnosed, but there was no association between using downward counterfactuals and PTSD (Gilbar, Plivazky & Gil, 2010). Upward counterfactual thinking was found in 60% of relief workers following the Indian tsunami, and was associated with PTSD four years later (Bhushan & Kumar (2012). “Why” and “what if” thoughts, together with other factors and in addition to rumination, explained an additional 18-39% of variance in PTSD severity, and explained an additional 17% of variance at 6 months over and above the presence of rumination (Michael et al., 2007). As noted by El Leithy, Brown & Robbins (2006), ruminating on alternatives to reality maintains PTSD symptoms, citing, for example, Dunmore, Clark & Ehlers, (2001). Depressed, trauma exposed individuals and those with PTSD ruminated more than did depressed non-exposed individuals and only the PTSD group reported that the trigger for intrusions was often or always the process of rumination. However, there were different types of ruminations, including “why” and “what if” cognitions (Birrer & Michael, 2011). The authors described rumination as a transdiagnostic process.

Coping strategies such as wishing that something had never begun can also be described as upward, non-referent counterfactual thinking, as was demonstrated in undergraduates exposed to the Virginia Tech shootings in April, 2007, in which 32 people died and many others were injured

(Littleton et al., 2011). However, although maladaptive coping, including this strategy, predicted distress over time as exhibited by depression and anxiety symptomatology, it did not predict PTSD symptomatology. Both distress and PTSD symptomatology predicted maladaptive coping. Thus, maladaptive strategies may lead to distress, but not to the symptoms of re-experiencing or hyperarousal.

Michael et al., (2007) suggested that upward counterfactual thinking may constitute a form of cognitive avoidance hindering emotional processing (Foa & Kozak, 1986) and other possible explanations for the operation of counterfactual thinking derive from the literature on thought control and rumination**.** El Leithy, Brown & Robbins (2006, p. 630) indicate that these two cognitive processes seem intertwined. Firstly, they suggest that inhibition of counterfactuals involves thought control strategies, since, in comparison with lower use of adaptive (social control, reappraisal and distraction) TCQ strategies, higher use was associated with higher counterfactual fluency just after experiencing assault, but lower at longer time points, predicting recovery. Those who used maladaptive (worry and punishment) TCQ styles "tended to only show a nominal decrease in counterfactual frequency as a function of time" whilst those using these styles less experienced a sharp decrease, predicting continuation of symptoms (El Leithy, Brown & Robbins, 2006, p. 632). This intertwining has been found elsewhere, such that attempts to control ruminative thoughts which were dominated by counterfactuals were unsuccessful in most participants (Hawkins et al., 2007).

El Leithy, Brown & Robbins (2006) suggested that, where individuals adopted an active reappraisal and reality testing approach, easier access was gained to the generation of counterfactuals in the short term, but to fewer in the longer term. Specifically, self-referent and additive upward counterfactuals were associated with planning. They suggest that "chronically elevated counterfactual activation may result from repetitively concentrating on a narrow range of available counterfactuals oriented around simple undoing, resulting in an adverse cost-benefit ratio of experienced discomfort relative to successful processing" (p. 634). Similarly, Roese (1997) noted that depressed individuals have difficulty suppressing negative thoughts, citing Wenzlaff, Wegner & Roper, (1988) and are thus vulnerable to the cyclical nature of counterfactual thinking. He further suggests that in uncontrollable situations, such as war, healthy, normative counterfactual thinking produces only unwanted negative affect, without the beneficial inferences which may be useful in the future.

Secondly, El Leithy, Brown & Robbins (2006) describe the various forms of counterfactual thinking (e.g. mental undoing, wishful thinking) as "PTSD ruminations" (p. 630). The process of rumination, "commonly defined as repetitive, cyclical, self-focused, and uncontrollable negative thinking about past negative experiences and/or negative mood that can be cued by an external event or a prior thought" (Birrer & Michael, 2011, p. 382) predicted depression and anxiety symptomatology (Nolen-Hoeksema, 2000). Rumination has been described as a transdiagnostic process with depressed and PTSD groups ruminating, but demonstrating different types of ruminations (Birrer & Michael, 2011). Negative appraisals of oneself during assault may lead to ruminative thoughts of how one might have avoided the assault using "if only" cognitions which may maintain or increase the symptoms of PTSD (Dunmore, Clark & Ehlers, 2001; El Leithy, Brown & Robbins, 2006).

Davis et al., (1995) suggest that counterfactuals are distinct from ruminations in that they are not thoughts about what occurred, but are simulations of what could or should have occurred. Counterfactual thinking is separable from rumination in terms of its connection to mental health outcomes, but ruminative counterfactual thinking is a risk factor for depressive symptoms (Epstude & Roese 2008). When the content of rumination is counterfactual, it helps to explain 18-29% of variance in PTSD severity on interview and 17% of variance beyond the presence of rumination itself six months later, along with unproductive thinking, compulsion to continue ruminating, and negative feelings (Michael et al., 2007).

Summary

Greater use of upward counterfactuals is associated with distress, anxiety and symptoms of depression, and when carried out repetitively might promote depressive states. Upward counterfactuals have been both associated with PTSD symptomatology and not associated. The process of upward counterfactual thinking may be unleashed by negative affect and may constitute cognitive avoidance hindering emotional processing and such counterfactuals may also be a form of PTSD rumination.

3.3 Humour

The first question arising when discussing humour is how to define it. This is not easy because, as pointed out by Moran & Masam (1997), there are various aspects to it. As this research programme investigates the use of humour in firefighters, the literature below is reviewed in the context of humour first as a cognitive appraisal or reappraisal mechanism to neutralise the effects of perceived stressors, then as a coping and bonding mechanism and then as a style of humour known as banter. The literature on associations between what might be described as a "sense of humour", stress and psychopathological symptoms is discussed briefly, but it appears that the style of humour, rather than a sense of it, is a more productive source of empirical evidence, and the focus is thus on this.

3.3.1 Humour as a cognitive appraisal/reappraisal mechanism

As a cognitive appraisal mechanism, humour appears to operate in two ways (Lazarus & Folkman, 1984; Kuiper, Martin & Olinger, 1993). High humour was associated with emotional distancing and confrontive coping, permitting individuals with it to remain unperturbed (Kuiper, Martin & Olinger, 1993) and therefore less likely to appraise something as a potentially harmful stressor (Abel, 2002; Kuiper, McKenzie & Belanger, 1995). Accordingly, using humour may be a "… healthy way of feeling a 'distance' between one's self and the problem" (May, 1953, p. 54). Coping with humour could involve both problem-focused and emotion-focused strategies (Lefcourt et al., 1997), and high humour students were more likely to use increased positive appraisal and problem-solving strategies than lower humour students (Abel, 2002). High humour students who had scored less than expected reappraised an exam as less personally important, and those who had scored higher than expected reappraised its importance as higher, which appears to be a self-protective strategy (Kuiper, Martin & Olinger, 1993). It may even be possible to reframe, or reappraise a horrific event through humour (Moran, 1990) and humour "has the potential for healing the wounds inflicted by terrorism" (Pasquali, 2003, p. 401). Humour contributes to a positive enhancement effect, indicating that high humour may be an indicator of resilience (Kuiper, 2012).

Of the many theories of humour (e.g. superiority, psychoanalytic, arousal, and reversal), the incongruity theory appears the most apt in this regard. This theory proposes that humour arises when there is a sudden perception of an inconsistency between a concept and reality (for discussion, see Martin, 2007, pp. 62-75) and "has emerged as the most supported and useful" (Robert & Wilbanks, 2012, p. 3). In the context of first responder occupations, reframing a stressful incident as humorous may be a way to cope with it and to bond with colleagues through sharing it.

3.3.2 Humour as a coping and bonding mechanism

Martin (2007) reports that short-term effects of humour in creating mood in laboratory conditions have been found, such as reduced anxiety after watching an amusing film (e.g. Moran, 1996) but there is little evidence of a long-term effect. Further, reduced physiological reactivity and negative affect occurred during the viewing of an unpleasant film when participants produced humour on demand, regardless of whether they were high or low in trait humour (Newman & Stone, 1996). A humorous response to stressors may act as an effective coping mechanism (Martin, 2007**;** Pasquali, 2003). High levels of coping humour have been found to moderate the effects of stress (Martin & Lefcourt, 1983), and acted as a buffer between exposure to PTEs, PTSD and burnout in firefighters (Sliter, Kale & Yuan, 2013).

Humour may be a mechanism creating emotional bonding (Moran & Massam, 1997; Gelkopf et al., 2006); contribute to the development of positive social support (Henman, 2001); or actually attract social support (Nezu, Nezu & Blissett, 1988). A strong *esprit de corps* (Aveline & Fowlie, 1987) may be facilitated through humour, operating as a form of language, or "restricted code" (Rowe & Regehr, 2010). One mechanism through which humour may operate as a facilitator of social support and *esprit de corps* is the production of laughter. In bereaved people, Duchenne (genuine) laughter was associated with emotion and evoked responses from others, whereas non-Duchenne laughter, unassociated with emotion, evoked little response (Keltner & Bonanno, 1997). Humour may benefit the individual as well as the group, in creating a positive self-concept. High humour individuals (greater use of it as a coping mechanism, higher frequency of mirthful response to difficult life situations, humour recognition and liking of humour) showed less discrepancy between actual and ideal self-concept; greater temporal stability of actual self-concept; increased sociability and decreased depressive personality; and reduced rigidity in standards evaluating self-concept (Kuiper & Martin, 1993).

3.3.3 Humour and psychopathology

The literature on the benefits of humour in regard to psychopathology is equivocal (Galloway & Cropley, 1999; Kuiper & Borowicz-Sibenik, 2005; Martin, 2007). High humour was associated with lower depression (Nezu, Nezu & Blissett, 1988; Thorson et al., 1997; Freiheit, Overholser & Lehnert, 1998); lower depression intensity (Corruble et al., 2004); mitigates depression only independently of the effect of life stress (Porterfield, 1987); with lower stress (Newman & Stone, 1996); lower stress and anxiety (Abel, 2002); lower mood disturbance (Martin & Lefcourt, 1983); is related to lower levels of worry (Kelly, 2002); and state cheerfulness "represents an actual disposition for

exhilaration" (Ruch, 1997, p. 340). High levels of agency (individual rather than group focus and personal control) and communion (focus on interpersonal relationships and goals over personal ones) attenuated the link between humour and depression, and low levels of agency and communion may amplify the link between humour and depression (Kuiper & Borowicz-Sibenik, 2004). In patients with unipolar major depressive disorder, higher use of humour was related to lower intensity of depression, but there was no difference in levels of humour between those who had recently attempted suicide and those who had not (Corruble et al., 2004). In a clinical setting, schizophrenic patients watching humorous videos on a near-daily basis for three months reported less anxiety and depression than those in the control group (Gelkopf et al., 2006).

Conversely, high humour was not associated with lower anxiety symptomatology (Nezu, Nezu & Blissett, 1988); by itself, the ability to appreciate humour is insufficient to reduce stress (Martin & Lefcourt, 1983); and a sense of humour was not associated with depression or anxiety reactions (Cann, Calhoun & Nance, 2000). However, Martin (2007, p. 275) stated that the literature reveals that "there is little evidence that high humor individuals are less likely to have psychiatric disorders than are those with less of a sense of humour". Citing Nevo, Aharonson & Klingman (1998) who found that a humour programme for teachers neither increased their ability to produce it nor to improve scores on self-report measures of humour, Martin (2007, p. 273) indicated a need to investigate whether "it is even possible to change the quantity or quality of people's everyday use of humor". One such investigation found that patients with depression trained to increase humour abilities experienced no significant effect on mood after 8 weeks (Falkenberg et al., 2011).

3.3.4 Humour in first responders: banter

The use of humour in the military and first responders including firefighters is documented in the literature (e.g. Jones, 1985; McCarroll et al., 1993; Alexander & Wells, 1991; Barnes, 1999). Humour has been reported as an important coping strategy in firefighters (e.g. Moran & Colless, 1995; Moran, 1998; 1999; Barnes, 1999; Haslam & Mallon, 2003, Nydegger, Nydegger & Basile, 2011) and appears to be an adaptive coping mechanism, associated with exhilaration, but the specific role it plays seems unclear (Moran, 1995). Little firefighter literature has explored direct associations between humour and psychopathology, but coping humour did buffer the relationship between exposure and PTSD symptoms (Sliter, Kale & Yuan, 2013). Such coping humour may be illustrative of "banter", which involves "piss taking", firstly out of one another and secondly out of the situations they encounter.

It seems that banter functions as a bonding mechanism. Groups with a strong *esprit de corps* (Aveline & Fowlie, 1987) may be bonded in part through humour operating as a form of language or

jargon, which creates “a unique identity and a private means of communication” (Moran & Massam, 1997, p. 4). Humour may facilitate positive social support (Fullerton et al., 1992). As one Crime Scene Investigator put it, “If they are giving you grief, they are giving you grief because they like you. In our culture if they are not giving you grief it’s a problem” (Vivona, 2014, p. 135).

Where the object of the joke in banter is not a fellow first responder, but the victim of an accident, the humour style is black, defined by The Encyclopaedia Britannica as humour which “juxtaposes morbid or ghastly elements with comical ones that underscore the senselessness or futility of life”. Existential incongruity is the basis of gallows humour, because the hopelessness of the situation justifies a mind shift from serious to playful (Kuhlman, 1988) cited by Watson (2011). Again, citing Kuhlman, gallows humour is thus a philosophical “way to maintain sanity under insane circumstances” (van Wormer & Boes, 1997, p.91) and the “reasons for using laughter in the emergency setting may have nothing to do with humour” (Scott, 2007, p.350). It is reported in emergency departments (van Wormer & Boes, 1997; Scott, 2007; Watson, 2011); and in medical students (Wear et al., 2006) as well as in the emergency services. It has been suggested that it is endemic in first responders and necessary to them (Rowe & Regehr, 2010). It is used because these professionals are frequently exposed to the dead and dying, sometimes in horrific ways and “within this ‘death work” (Henry, 2004) humor, jokes and laughter can be found” (Vivona, 2014, p.128). It is a way of coping with death and tragedy (Pasquali, 2003) as has been illustrated in the literature, for example: “To tell the truth, the only way me and my friends found to keep one sane was to joke around so much and to keep laughing, even if it meant making fun of bodies” (Jones, 1985, p. 306). Similar comments have been attributed to firefighters: “Anyway, we used to make horrible jokes about deaths and things like that and it was probably pretty gruesome to outsiders but for us it was a way of I suppose coming to grips with what had gone on” (Barnes, 1999, p. 61).

Gallows, black or dark humour is an intentional mental disengagement, used as a form of intentional distraction from a stressor through a cognitive shift or reframing it so that it becomes less stressful (see Vivona, 2014). This type of humour might seem highly offensive (Rowe & Regehr, 2010) or “distasteful” as one worker in the Jonestown body recovery put it (Jones, 1985, p.307) and not all emergency workers feel comfortable using such humour; some body handlers reported that they were frightened of it because it meant they had “gone over the edge” (McCarroll et al., 1993, p. 212). However, the language is not expressed in any way with the intent to show disrespect to a victim, but as a diversion (Vivona, 2014). Similarly, medical students will not make jokes about people who are dying (Wear et al., 2006).

The use of banter within first responder organisations might be seen as harsh, either when “taking the piss” out of one another is remorseless, or when the victim is the butt of the joke. But the literature suggests that banter has rules. The first is that it is reciprocal, explained by one firefighter in a personal communication [06.03.14] as meaning that if a firefighter “takes the piss” out of others, but cannot take it himself, he is seen a “one-handed butler” or, as, in the experience of CSIs, it is “expected that what they gave out they would get right back” (Vivona, 2014, p. 135). The second rule is that the timing of humour is critical. Black humour has its context, being a “restricted code” in emergency professionals (Rowe & Regehr, 2010), confined to the workplace. David Alexander states that he can personally confirm “the relief that a well-timed joke or wisecrack can achieve, but quoted out of context, it would quite rightly be adjudged tasteless and offensive” (Alexander & Wells, 1991, p. 552). This may mean that any relief it brings is restricted to work time: “While firefighters normally do not take home the black humour of the mess room, an invisible element of their work often goes home with them: the grief and emotional shock of exposure to accident trauma” (Barnes, 1999, p. 59).

The third rule is that any humour is unacceptable in some situations, particularly when the victim is a child, or where an officer had known the victim (Vivona, 2014). The fourth rule is that the value attributed to humour within the emergency professions lies in its absence. It is then that supervisors become concerned because it is an indicator that the well-being of the team may be at risk, its members overwhelmed by effects of their emotional burden (Vivona, 2014).

It seems generally agreed in the literature that in the emergency response occupations, humour “is a healthy therapeutic tool we must recognize, cultivate, and use” (Rubin, 1990, p.16). It is endemic in first responders and necessary to them (Rowe & Regehr, 2010).

3.3.5 Style of humour: The HSQ

Humour “style” appears to be a more accurate linguistic term than “sense” of humour as is reflected by the development and use of the Humour Styles Questionnaire (HSQ; Martin et al., 2003) which has been described as “the most theoretically well-developed and integrative” model (Robert & Wilbanks, 2012 p. 13). Four humour styles are included, two of which (affiliative and self-enhancing) can broadly be described as positive and two (aggressive and self-defeating) are broadly negative.

Affiliative

This incorporates joking and banter and "presumably enhances interpersonal cohesiveness and attraction" (Martin et al., 2003, p. 53). In general, greater use of affiliative humour is associated with good mental health (Chen & Martin, 2007); less depression (Martin et al., 2003; Chen & Martin, 2007; Frewen et al., 2008; Olson et al., 2005; Cheung & Yue, 2012); less anxiety (Martin et al., 2003; Kuiper et al., 2004;) more resilience under stress (Cheung & Yue, 2012); greater affective wellbeing (Janovic, 2011); greater positive affect (Kuiper et al., 2004); and buffers acculturative stress of study hassles in sustaining life satisfaction (Cheung & Yeu, 2012).

Greater use of affiliative humour is also associated with higher life satisfaction, (Janovic, 2011; Cheung & Yeu, 2012); greater agreeableness (Saraglou & Scariot, 2002); greater openness (Saraglou & Scariot, 2002); higher self-esteem (Saraglou & Scariot, 2002; Martin et al.,2003; Kuiper et al., 2004; Stieger, Formann & Burger, 2011); higher extraversion (Martin et al., 2003; Veselka et al., 2010a); higher openness to experience (Martin et al., 2003; Veselka et al., 2010a); higher cheerfulness (Martin et al.,2003) greater social intimacy (Martin et al.,2003); and greater self-competency judgments of ability to initiate social contact and for anxiety control over potentially threatening events (Kuiper et al., 2004).

Greater use of affiliative humour is associated with higher levels of narcissism (Veselka et al., 2010b; Martin et al., 2012); lower neuroticism/emotionality (Veselka et al., 2010a) and partially mediates the relationship between neuroticism and affective well-being (Janovic, 2011); lower self-criticism and neediness, although the style does not moderate the relationship between them and depressive symptoms (Besser, Luyten, & Blatt, 2011); lower disconnection (expectation that needs for nurturance, safety, acceptance and respect will not be met) and impaired autonomy (anticipation of inability to function independently) (Dozois, Martin & Bieling, 2009).

However, greater use of affiliative humour does not increase satisfaction with social support (Martin et al., 2003) which may suggest that this style is less indicative of sharing humour with others and more of a perspective in general. Further, an unexpected correlation between affiliative humour and lower honesty-humility is speculated to be indicative of "insincere adulation in an effort to secure friendships" (Veselka et al., 2010a, p. 25). Affiliative humour did not significantly influence innovative behaviour or effectiveness in leaders (Ho et al., 2011)

Self-Enhancing

This style of humour reflects possession of an outlook which is generally humorous and to be able to maintain it even when under pressure, to help one to cope (Martin et al., 2003).

Greater use of self-enhancing humour is associated with good mental health on ten separate measures (Chen & Martin, 2007); less depression and anxiety (Martin et al., 2003; Chen & Martin, 2007;Kuiper at al., 2004; 2007;) less depression (Kuiper et al., 2004; Frewen et al., 2008; Dozois, Martin & Bieling, 2009), and bad mood (Martin et al., 2003**)**; buffers the negative effect of rumination on symptoms of depression (Olson et al., 2005), the effect of stressors (Cheung & Yue, 2012; Cann, Stilwell & Taku, 2010); is most closely related to humour as a coping mechanism (Martin et al., 2003); and is associated with satisfaction with life (Janovic, 2011).

Greater use of self-enhancing humour is associated with greater affective wellbeing (Janovic, 2011); greater positive affect (Kuiper et al., 2004); extraversion (Martin et al., 2003; Veselka et al., 2010a); higher agreeableness (Saraglou & Scariot, 2002; Veselka et al., 2010a)**;** openness to experience (Saraglou & Scariot, 2002; Martin et al., 2003; Veselka et al., 2010a) self-esteem (Saraglou & Scariot, 2002; Martin et al., 2003; Kuiper et al., 2004); cheerfulness, optimism, psychological well-being, satisfaction with social support, and masculinity (agency)(Martin et al., 2003); and greater self-competency judgments of ability to initiate social contact and for anxiety control over potentially threatening events (Kuiper et al., 2004) and increased innovative behaviour and leadership effectiveness (Ho et al., 2011). This style also mediates the relationship between extravertism, neuroticism and satisfaction with life (Janovic, 2011).

Greater use of this style is associated with lower self-criticism and neediness, although the style does not moderate the relationship between them and depressive symptoms (Besser, Luyten, & Blatt, 2011); lower neuroticism/emotionality (Veselka et al., 2010a); lower negatively valued femininity (unmitigated communion) (Martin et al., 2003); and is negatively associated with all domains of early maladaptive schemas possibly providing a buffer against dysphoria and negative beliefs (Dozois, Martin & Bieling, 2009). Individuals with high scores on a narcissism measure in one of two studies had a tendency to use this style (Veselka et al., 2010b**)** but this was not replicated by Martin et al., (2012).

Aggressive

This style reflects a tendency to use humour at the expense of others, for example being sarcastic or disparaging (Martin et al., 2003). Greater use of aggressive humour is associated with poor mental health on six separate measures (Chen & Martin, 2007); both with greater anxiety (Chen & Martin, 2007) and not (Kuiper et al., 2004); with both greater depression mediated by self-criticism (Besser, Luyten, & Blatt, 2011); and not associated with depression (Dozois**,** Martin & Bieling, 2009; Kuiper et al., 2004) and is associated with lower affective well-being (Janovic, 2011).

Greater use of this style is associated with more hostility and aggression (Martin et al., 2003), and need for control (Frewen et al., 2008); and with higher self-criticism and neediness (Besser, Luyten, & Blatt, 2011) but was unrelated to satisfaction with life (Janovic**,** 2011).

Greater use of aggressive humour is associated with lower agreeableness and conscientiousness, (Saraglou & Scariot, 2002; Martin et al., 2003; Veselka et al., 2010a); lower HEXACO honesty-humility (Veselka et al., 2010a); lower HEXACO emotionality (Veselka et al., 2010a) but conversely higher neuroticism (Martin et al., 2003); greater sub-clinical psychopathy and Machiavellianism (Veselka et al., 2010b; Martin et al., 2012); narcissism (Martin et al., 2012); higher self-criticism and neediness (Besser, Luyten, & Blatt, 2011); and the early maladaptive schema of impaired limits (insufficient self-control, entitlement) (Dozois, Martin & Bieling, 2009). It is positively associated with unmitigated masculinity and negatively related to femininity, and seems to be more common in males than females (Martin et al., 2003).

This style is also associated with lower leadership effectiveness in the workplace (Ho et al., 2011) and a lower ability to provide appropriate emotional support or take part in facilitative conflict management (Kuiper et al., 2004).

Aggressive humour is not associated with any positive indices of well-being (Kuiper et al., 2004).

Self-Defeating

This style incorporates the use of self-disparaging humour to ingratiate oneself with others and joining in with jokes made against oneself and may be "a form of defensive denial" (Martin et al., 2003, p. 54). Greater use of self- defeating humour is associated with more distress and worse mental health on ten separate measures (Chen & Martin, 2007); including depression/anxiety (Martin et al., 2003; Chen & Martin, 2007; Kuiper et al., 2004; Frewen et al., 2008; Dozois, Martin & Bieling, 2009; Besser, Luyten, & Blatt, 2011); psychiatric symptoms (Martin et al., 2003); worse mental health (Cann & Etzel, 2008); perceived stress, which is only partially mediated by optimism, hope and happiness (Cann, Stilwell, & Taku, 2010); bad mood (Martin et al., 2003); hostility, (Martin et al., 2003); and lower affective well-being **(**Janovic**,** 2011). It is both unrelated to satisfaction with life **(**Janovic**,** 2011) and with lower life satisfaction (Cheung & Yue, 2012) and associated with lower satisfaction with social support (Martin et al., 2003).

Greater use of this style is also associated with lower agreeableness (Martin et al., 2003; Veselka et al., 2010a); lower emotional stability (Saraglou & Scariot, 2002); lower conscientiousness (Saraglou & Scariot, 2002; Martin et al., 2003; Veselka et al., 2010a); lower honesty-humility (Veselka et al.,

2010a); lower security in attachment (Saraglou & Scariot, 2002); lower self-esteem (Saraglou & Scariot, 2002; Martin et al., 2003; Kuiper et al., 2004; Stieger, Formann & Burger, 2011); self-worth based on the opinion of others (sociotropy) (Frewen et al., 2008); and lower competency judgments for anxiety control over potentially threatening events (Kuiper et al., 2004). It is associated with lower psychological well-being and intimacy (Martin et al., 2003).

Greater use of self-defeating humour is associated with higher emotionality/neuroticism (Veselka et al., 2010a; Martin et al., 2003); with four early maladaptive schemas (Dozois, Martin & Bieling, 2009); and with higher self-criticism and neediness (Besser, Luyten, & Blatt, 2011). It is employed more by higher scorers on measures of sub-clinical psychopathy and Machiavellianism (Veselka et al., 2010b; Martin et al., 2012). Greater use of self-defeating humour is positively associated with unmitigated masculinity and negatively related to femininity, and seems to be more common in males than females (Martin et al., 2003). Neither innovative behaviour nor leadership effectiveness was significantly influenced by the use of self-defeating humour (Ho et al., 2011).

3.3.6 The styles and other factors

Differences have been found between the use of humour in men and women, which may have relevance to firefighting, still a predominantly male profession, for example, men scored higher than women on aggressive and self-defeating humour (Martin et al., 2003). *S*elf-defeating humour was positively correlated with coping humour in Chinese females indicating that the humour they used to cope with stress was self-derogating to maintain group cohesion, and was used more by Chinese females than Chinese males or Canadian participants. Use of affiliative and self-enhancing humour was similar in both countries in terms of lack of gender diffences. Canadian participants used aggressive humour significantly more than Chinese participants, and the former report higher use of all styles than do the latter (Chen & Martin, 2007). Self-defeating humour may be viewed differently in western and oriental societies because of the culture of individualism in the west where self-defeating humour may be considered detrimental to self-esteem and self-confidence. Collectivist oriental societies value modesty and self-defeating humour and this humour style is seen as “making fun of oneself” which is widely accepted (Ho et al., 2011, p. 6682).

The distinction between potentially benign and detrimental forms of humour is “one of degree, rather than a dichotomy” (Martin et al., p. 52). The styles can be either protective of the self, such as coping and black humour, or protective of relationships with others, such as humour used to raise spirits of others and as a bonding mechanism. The adaptive/maladaptive nature of the styles is cross-functional: self-enhancing humour may protect oneself without being detrimental to others, but aggressive humour protects oneself through teasing while damaging those teased. Where the

teasing is friendly and playful, it may be affiliative in style rather than aggressive (Martin et al., 2003) and where humour is used in a "self-deprecating manner based on a fundamental sense of self-worth" it may be affiliative in style, whereas when it is "excessively self-disparaging humour arising from a negative self-concept" is constitutes self-defeating humour (Martin, 2007, p.283).

There is no assumption made that the functions are consciously used as, when trying to cope with a stressful situation, humour may be more of an automatic response (Martin et al., 2003). This seems to be the case with emergency workers who may find it difficult to describe what they found amusing after the event, humour usually seeming to arise spontaneously, rather than as a "conscious attempt at coping"(Moran,1990, p.6; Moran & Massam, 1997).

Conclusion

Affiliative humour appears generally to be associated with positive outcomes, although perhaps weaker than self-enhancing in protecting against mental distress. The aggressive style has not been consistently associated with depression or anxiety, whereas the self-defeating style negatively correlates with these disorders. Only the self-directed styles, self-enhancing and self-defeating, were reliably related on regression analysis to well-being outcome measures (Chen & Martin 2007) and explained variance in remembered stress (Cann & Etzel, 2008) suggesting that the other-directed styles of affiliative and aggressive humour may be of more benefit (or detriment) to others than to the self.

However, this is not definitive. In a vignette study, participants recorded more positive reactions towards a speaker labelled as depressed when that speaker's comments were both affiliative in nature and humorously made than when they were affiliative but non-humorous. As the authors state "Rather ironically, then, it appears that the style of humor depressed individuals use the least (affiliative) is the same style of humor that could result in the most positive social responses" (Ibarra-Rovillard & Kuiper, 2011, p. 454).

3.5 Research aims based on findings from the literature on thought control, counterfactual thinking and humour style

The literature reviewed suggests that variants of thought control, counterfactual thinking and humour style may be either adaptive or maladaptive with respect to psychopathological responses to exposure to PTEs.

Thought Control

The strategies measured by the TCQ which are used to control thoughts will be explored in the context of their use in the firefighter population within the UK. On the basis of the literature reviewed, it is expected that greater use of the distraction and social control strategies will relate to lower distress in terms of symptomatology of PTSD and depression, conversely use of worry and punishment strategies will relate to greater distress in terms of symptomatology of PTSD, anxiety and depression. Associations with alcohol misuse are exploratory in nature. Given the ambiguities in the literature discussed above, it can only be speculated whether greater use of the reappraisal strategy will relate to better or worse mental health symptomatology, but study 1 responds to the call for further studies to examine the methods of thought control across anxiety disorders (Coles & Heimberg, 2005).

Counterfactual thinking

Upward counterfactual thinking has been associated with distress and PTSD, and although research has increased in recent years, comparatively little has been conducted within traumatology in the field. Whether first responders, and specifically firefighters, generate counterfactuals in the aftermath of attendance at a PTE; whether they are upward or downward in direction; and whether such counterfactuals are predictive of symptomatology of psychopathology is currently unknown. As has been noted, most of the literature on counterfactuals uses vignette studies relating to hypothetical scenarios, and study 1 examines their use in the field, which may be more ecologically valid (Uphill & Dray, 2009). It is speculated that the generation of upward counterfactuals of all three types (self, other and non-referent) will be associated with increased symptomatology of all four psychological conditions, and that downward counterfactuals will be associated with less symptomatology.

Humour style

Humour may be used to distance oneself from a stressor, operating as a cognitive reappraisal of an emotionally disturbing PTE, and greater use of humour may predict resilience, operating as a coping mechanism. On the basis of the literature, it is expected that use of the positive humour styles of affiliative and self-enhancing humour will be associated with lower levels of symptomatology; that the use of the aggressive style will have no relationship with symptomatology; and that increased use of the self-defeating style will relate to higher levels of symptomatology. Furthermore, study 1 will also examine whether it is the supportive aspect of the fire service which is protective or whether it is also true of non-occupational support.

These questions will be addressed in the series of studies. Study 1 investigates these cognitive constructs using instruments whose subscales measure factors of each construct, whilst studies 2 and 3 examine the use of the constructs in a broader sense. The next chapter will describe the Methods used in more detail.

Chapter 4 : Methods and Measures

4.0 Introduction

Three separate investigations were undertaken with UK firefighters. The first is a cross-sectional, quantitative survey conducted with 154 firefighters and entitled "Survey of Responses in Firefighters to Different Types of Work-Related Incidents". Data were collected on demographics and incident exposure; levels of symptomatology of posttraumatic stress disorder, depression, anxiety and alcohol misuse; and three cognitive potential risk factors for the development of psychopathology: thought control, counterfactual thinking and humour style.

At the commencement of the research, the intention was to follow this cross-sectional investigation with a qualitative survey of a randomly collected group of firefighters. However, during the data analysis period, a critical incident occurred to which a discrete group of firefighters was exposed, and the decision was made to collect data from this group relating to this particular incident. This became a longitudinal investigation into the reactions of this group to the incident at T1, approximately 6 months post-incident (*n* = 23) and T2, approximately 15 months post-incident (*n* = 14). The third investigation consisted of a qualitative study conducted with volunteers who had just participated at T1 (n = 17), undertaken immediately after the quantitative data were collected, that is, approximately six months after the critical incident.

The critical incident investigated in the longitudinal and qualitative surveys is referred to as the "Study Incident" and is described at study 4.2 below.

4.1 Study 1: Cross-sectional quantitative survey

4.1.1 Participants

The population available totalled 163 individuals (approximately replicating the proportions of each type of service – wholetime, day crew and retained). Four firefighters declined to participate, and two recruits felt they had "nothing to offer" 157 firefighters returned completed questionnaires (96.3%), 154 of which were unspoiled (98% of returned papers), giving an overall 94.5% of the target population providing usable data.

The members of the survey sample were UK firefighters employed at a number of different fire stations, each working on one of three duty systems. The system first consisted of whole-time firefighters who worked a pattern of two day shifts, two night shifts, and four days off. There were four watches on each of these whole-time stations. The second were day-crew who lived adjacent to the station in supplied houses and worked a pattern of day shifts and leave days, being on call from home overnight following a day shift. There were two watches on each of these day crew stations. The third were retained firefighters who were not full-time employees, but were summoned from their full-time employment or home address by pager when required.

The sample consisted of eleven of the twelve whole-time watches serving on three stations, each of which crewed two firefighting appliances; all eight watches from two fire stations crewing one appliance; both watches from a day crew station; five crews from retained fire stations; and a number of supervisory officers who worked alone.

The sample group is representative of the fire services in England insofar as it reflects the ratio of those services which utilise retained firefighters in addition to whole time firefighters. In this study, 96 whole time and 32 retained firefighters were recruited, emulating the total number of whole time firefighters in England at 29,735 and retained at 11,899 (Department for Communities and Local Government, 2010).

Given the exploratory nature of the study, the large number of variables measured and the fact that no previous studies had examined the same variables, no effect size on which to base a power calculation was anticipated. In the first instance, it was determined that, for a 1-tailed test (i.e. direction predicted) with alpha = .05 and power = .80, 150 participants would be sufficient for a small correlation (r = .2) to be significant, as determined by G-Power (Version 3.1.9.2). It was intended to include in subsequent regression analyses (in addition to the TCQ, CTNES and HSQ subscales) only those variables that were significantly correlated with at least one of the outcome variables in order to minimise the number of potential predictors.

4.1.2 Procedure

Dean, Gow & Shakespeare Finch (2003) reported an overall 79% response rate from Australian firefighters, with a 58% response for surveys returned by mail compared with 100% of those completed during visits to stations. It was determined that, to maximise responses, all data would

be collected at stations. Introduction to the study sample was effected through a Fire Officer employed by a UK Fire Service, “the Facilitating Fire Officer” (“FFO”). He arranged access for the researcher to the highest ranking senior Fire Officers enabling her to explain the purpose of the study and gain permission to conduct it. The Fire Brigades Union was also consulted. The first step of the process involved an advisory flyer sent by email to serving firefighters giving outline details of the project and seeking voluntary participation. The FFO co-ordinated the logistics of arranging for individual watches to be present at specific fire stations at pre-arranged times in order to complete the questionnaire. This took place over a period of just over one year. This was planned to be completed within six months but unusually bad weather during the winter of 2010 caused the postponement of a number of sessions, which were subsequently postponed again due to the serious illness of the Facilitating Fire Officer.

All sessions were conducted using the same method. The researcher, accompanied by the FFO, attended in a training room or mess deck of each fire station. The FFO introduced the researcher and explained the voluntary nature of the study, the fact that there would be no repercussions if any individual decided not to complete the survey at any time, and the anonymity of the survey. The researcher then explained that the survey was not funded by the Fire Service nor by the Union but by herself and that it had received Ethics Approval. As anonymity was clearly a concern, the procedures in place were explained, namely that firefighters would choose a number randomly obtained (from wwww.psychicscience.org/random.aspx 7th June 2010) which they were to affix to the Consent Form they would sign preceding the study itself. This Consent Form would then be separated from the questionnaire so that there could be no future connection between the name on the Consent Form and the individual responses, which could only be identified by number. The researcher then explained the purpose of the survey as set out in the Information Sheet and provided a copy of the Information Sheet to each firefighter. The firefighters were then provided with the survey form. Both the researcher and the Facilitating Fire Officer remained with the group throughout the completion of the questionnaires in order to provide clarification with regard to interpretation of any of the measures or procedures used.

Completion of the survey took firefighters between approximately 40 and 90 minutes. Following completion, each completed survey form was handed to the researcher. A group debriefing session followed, in which participants were given a debrief sheet and were provided with the opportunity to ask questions. They were also informed that, if they wished

to take part in subsequent interviews, they were free to do so, or to decline, with no consequences to themselves.

4.1.3 Measures

Firefighters responded to the survey which contained a number of separate measures. These required responses by different methods, for example, through circling or ticking a statement or filling in a number on a scale. With the exception of the demographic questionnaire, which was always the first measure in the survey, the order in which the measures appeared was systematically varied in order to minimise the effect of questionnaire fatigue. The full survey is available in Appendix A.

Demographic questionnaire:

Firefighters were asked typical demographic variables (type of firefighter, gender, marital status, number of children, education, length of service, rank, geographical location of fire station, prior military service, ethnicity and whether they were under any disability. They were then asked questions relating to their health (medical assistance connected with their work, diagnosis of psychiatric illness for which medical assistance had been given, medication for mental health, and use of counselling or other medical health assistance). The CAGE Questionnaire (CAGE; Ewing, J., & Rouse, B.A., 1970) was inserted into the demographic questionnaire as it is a four question measure of alcohol misuse which fitted appropriately alongside the health questions. Finally, the firefighters were asked to think about the person they would say was the closest to them, outside of work (in other words, not a fellow firefighter) and to record this person's name or initials. This person, who was referred to as "X", was to be the person the firefighters had in mind when answering certain other measures.

Criterion A1 Incident Exposure Data

At the time the survey was conducted, DSM-IV remained in force. Further to the comment by Haslam & Mallon (2003) that lists of events experienced by firefighters may not be detailed enough to know the precise nature of the event (e.g. "serious accident" and "other rescue situation") a more detailed list was developed in conjunction with the Facilitating Fire Officer to explore whether different types of accident were more psychonoxious than others. The firefighters were asked to measure from zero upwards the number of certain types of incident they had experienced within the last month; last 6 months; last year; and during service. The first category of incidents was road

traffic collisions, fires and other (which they were asked to specify). The second category of incidents were more detailed, consisting of persons trapped (or reported trapped) in each of road traffic collisions, fires and other types of incident); fatal injury to member(s) of the public; serious injury to member(s) of the public; serious injury to colleague; fatal injury to colleague; serious injury to the firefighter respondent); perceived danger to the respondent; perceived danger to colleagues; and, perceived danger to member(s) of the public.

Next, the firefighters were asked to enter the number of times during four periods (last month, the last 6 months, last year and during service) in which they had been actively involved in the recovery, attempted resuscitation or transportation of either or both a colleague or civilian who died during an incident. The firefighters were then asked to think of an incident they remembered well during their time as a firefighter and tick any of the following which applied to that incident: actual death of a civilian; actual death of a colleague; actual serious injury to the firefighter respondent; actual serious injury to a civilian; actual serious injury to a colleague; threatened death/serious injury to the respondent; threatened death/serious injury to a civilian; and threatened death/serious injury to a colleague.

Criterion A2

Del Ben et al., (2005) reported that in almost all self-report trauma research an evaluation of the A1 and A2 Criteria for DSM-IV PTSD was absent. The inclusion of A2 in their study on firefighters resulted in a decrease of PTSD caseness. Therefore, the firefighters were asked whether they had experienced intense fear, helplessness or horror in response to an event or events that involved actual or threatened death or serious injury to anyone during their service, answering “never”, “sometimes”, “often”, or “always”. This question was then repeated, but with the firefighters asked to provide these responses in respect of such an event outside their service as a firefighter, and to give an estimated number of times they had experienced such an event.

Symptom measures

Impact of Event Scale-Revised (IES-R; Weiss, D.S., & Marmar, C.R., 1997). The IES-R is a 22-item instrument used to assess trauma-related symptoms on three subscales: avoidance, intrusions and hyperarousal. Responses to each of the questions are indicated on a 5-point scale according to their frequency of occurrence over the preceding seven days. The scoring range is 0 – 88. A score of ≥ 33 represents the best cut-off for a probable diagnosis of PTSD (Creamer,

Bell & Failla 2003). Wagner (2011) found no evidence to support a multi-factorial structure for the IES-R in firefighters upon factor analysis. Rather, a scree plot analysis suggested that a two factor structure of general "post-traumatic symptomatology" and "sleep" may provide the best fit. Consequently, Wagner (2011) suggested using an overall IES-R score rather than the subscales in firefighter samples. However, these results are exploratory, as the author states and, whilst research continues into evaluation of the subscales in the firefighter population, this survey employed analysis of the subscales and the total IES-R scores. In this survey, high internal reliability was confirmed for the IES-R overall (α = .94) and for each individual sub scale; avoidance (α = 82), intrusions (α = .93), hyper arousal (α = .83).

Patient Health Questionnaire (PHQ-9; Kroenke, K., Spitzer R.L., Williams, J.B., (2001). The PHQ-9 is a self-administered version of the PRIME-MD diagnostic instrument for common mental disorders. The instrument constitutes the depression module of the PRIME-MD and scores the nine DSM-IV criteria on a 4-point scale of symptom frequency from "not at all" to "nearly every day" during the past two weeks. A tenth item relating to difficulty in functioning is not used in the scoring (Kung et al., 2013). Depression severity is scored as none (0-4), mild (5-9), moderate (10-14), moderately severe (15-19) and severe (20-27). Optimized sensitivity and specificity was identified at ≥ 10 (Kroenke et al., 2010). Scores in the "moderately severe" range on the PHQ-9 correlate with "moderate" or "severe" on the BDI-II (Kung et al., 2013). High internal reliability for the PHQ-9 overall was confirmed in this Study (α = .86).

The Generalised Anxiety Disorder Assessment (GAD-7; Spitzer, R.L., Kroenke, K., Williams, J.B.B., & Lowe, B., 2006). The GAD-7 is a self-administered patient questionnaire used as a screening tool. Respondents rate the seven items on a 4-point scale of symptom frequency from "not at all" to "nearly every day". Scores of 5, 10 and 15 are taken as cut-off points for mild, moderate, and severe anxiety, respectively. Optimized sensitivity and specificity was identified at ≥ 10 (Spitzer et al., 2007; Kroenke et al., 2010). In this Study, high internal reliability for the GAD-7 was confirmed overall (α = .90).

The CAGE Questionnaire; (CAGE; Ewing, J., & Rouse, B.A., 1970). CAGE stands for the italicised first letter of each of the four questions: cut down alcohol intake/annoyed at others' criticism of drinking/guilt at drinking behaviour/early morning drinking. The questionnaire was developed by Dr Ewing and presented at an International Conference on Alcoholism, but the paper was not published externally. A validating study was performed by Mayfield, D.G.,

McLeod, G., & Hall, P. (1974). CAGE consists of four questions to which respondents answer "yes" or "no". Two or three affirmative answers should create a high index of suspicion and four is seen as pathognomonic (signs so characteristic of a disorder that they can be used to make a diagnosis) for alcoholism. In this Study, a moderately high internal reliability for the CAGE was confirmed (α =.56).

Malet et al., (2005) tested the French version of CAGE in hospital patients, finding sensitivity of 77% and specificity of 94%.The CAGE was described as a good screening tool for alcohol use/dependency. A meta-analysis of studies conducted using the CAGE questionnaire in general clinical populations (Aertgeerts, Buntinx & Kester, 2004) concluded that the use of it is only of limited value at the recommended cut-off point of ≥ 2 in an "ambulatory medical patient setting" (p. 37); that this point is reached with a frequency four to seven times greater in those with alcohol problems that than those without; and that 50% of patients will have alcohol problems with only one positive response. Meyer et al., (2012) administered the CAGE questionnaire to United States firefighters using a score of 1 to indicate possible abuse and ≥2 to indicate probable abuse. Thus, the results of CAGE analyses are shown in four categories: 'pathognomic'; 'probable', 'possible' and 'none'.

Potential Cognitive predictors of PTSD

*The Thought Control Questionnaire (*TCQ; Wells, A., & Davies, M.I., 1994). The TCQ consists of 30 questions measuring five different dimensions of thought control (distraction, social control, worry, punishment and reappraisal). Responses are given on a 4-point scale from "never" to "almost always". A total TCQ score is obtained by summing the individual scales. Participants in the cross-sectional survey were asked to complete the TCQ bearing in mind the incident remembered well which they had recorded earlier in the incident exposure section.

For the TCQ questionnaire, high reliability was again found for the scale overall (α = .82), and for each individual subscale; distraction (α = .80), social (α = .70), worry (α = .80), punishment (α = .68) and reappraisal (α = .78).

The Counterfactual Thinking for Negative Events Scale (CTNES; Rye, M.A., Cahoon, M.B. Ali, R.S., & Daftary, T., 2008). The CTNES consists of 16 questions which are responded to on a 5-point scale from "never" to "very often" and has four sub-scales, nonreferent downward (without reference to self or others e.g. "I think about how much worse things could have

been"); other-referent upward (reference to actions of others e.g. "If only another person/other people had not been so selfish, this whole mess could have been avoided"); self-referent upward (reference to actions of self e.g. "I wish I had a time machine so I could just take back something I did"); and nonreferent upward (without reference to self or others e.g. "Although the bad situation was nobody's fault, I think about how things could have turned out better".

Participants in the cross-sectional survey were asked to bring to mind the incident they remembered well and then to rate the frequency with which they experienced the thoughts described in the following questions. There was high reliability for the CTNES overall ($\alpha = .88$), and each of the individual subscales non referent downward ($\alpha = .87$), other referent upward ($\alpha = .76$), self-referent upward ($\alpha = .78$) and non-referent upward ($\alpha = .80$).

The Humor Styles Questionnaire; HSQ, Martin, R.A., et al, 2003). The HSQ measures individual differences in uses of humour through a 32 question measure to which responses are rated on a 7-point scale from "totally disagree" to "totally agree". The HSQ measures four different types of humour: affiliative, self-enhancing, aggressive and self-defeating. The first two can be described as positive humour styles; affiliative being the tendency to share humour with others, telling jokes and stories, and self-enhancing humour signifies a tendency to maintain a humorous outlook even when alone. Similarly, the two more negative styles are outward-facing style in the aggressive style which involves a tendency to disparage, put down or manipulate others and includes offensive humour; whereas self-defeating is inward facing, involving a tendency to amuse others at one's own expense and a self-disparaging sense of humour.

In the light of the unusual dual social support system within the firefighter population, permission was sought and obtained from the author of the HSQ, Rod Martin, to adapt the measure so that each question was asked of participants firstly in relation to the humour they used with their work colleagues and secondly with "X", the person they had chosen as the one most close to them outside work. The intention was to capture any differences between styles of humour used in the work and social environments. This is the first time the HSQ has been used to achieve this.

Further, as the literature and anecdotal evidence suggest that the use of black humour is prevalent amongst first responders, a brief Black Humour Scale was devised and utilised, again both in the work and social domains. The decision was made to create a scale which used the specific term "black

humour", firstly to ensure that participants focused on this, rather than other types of offensive humour, and secondly, because it was hypothesised that the use of this humour in firefighters was positive in effect as a stress-reliever and bonding mechanism. These questions required agreement or otherwise with the following four statements "I made a victim of the incident the butt of a joke"; I made other responders the butt of a joke"; "Using black humour made me feel better" and "Colleagues/X using black humour did or would have offended me".

Two versions of the questionnaire were thus created; the HSQ refers to respondents completing the measure in relation to work colleagues, whereas the HSQ-X refers to responders completing the measure in relation to someone close outside of work. For the HSQ the internal reliabilities were: for the questionnaire overall (α = .82); and for affiliative (α = .70), self-enhancing (α = .73), aggressive (α = .71) and self-defeating (α = .81). Reliability of the overall questionnaire increased when the black humour items were included (α = .85). Indeed, reliability for the new four-item subscale was good (α = .70). For the HSQ-X internal reliabilities were for the questionnaire overall (α = .81); and for affiliative X (α = .69), self-enhancing X (α = .74) and self-defeating X (α = .77). The subset of aggressive X however was slightly less reliable (α = .57). The new black X subset improved the questionnaire (α = .82), with the Black X subscale confirming high reliability (α = .69).

4.1.4 Data analysis

The data were subjected to analysis in six steps using correlational, t-test and ANOVAs. First, the caseness prevalence rates of PTSD, depression, anxiety and alcohol misuse in the survey sample were determined; secondly relationships between these conditions and pretrauma variables were determined; thirdly, relationships between these conditions and occupational variables were determined; fourthly, relationships between these conditions and A1 events and between the conditions and A2 responses were determined; and fifthly, relationships between the conditions and the three cognitive processes were determined. On completion of these analyses, a multiple regression analysis was undertaken. These steps, and their results, are described in more detail in the Results Section.

4.2 Study 2: Longitudinal study

4.2.1 Introduction

Following completion of the data collection in the cross-sectional survey, and during the course of data analysis, the researcher was notified that a group of firefighters, many of whom participated in that survey, had responded to a critical incident in which the life of the casualty could not be saved. This incident involved unusual occupational demands and had the potential to be psychonoxious because of its horrific circumstances. Full details of the incident cannot be given since disclosure would put at risk the identity of those involved, including family members and responding crews. This does not diminish understanding of the results because the limited description of its features suffices to show that was a DSM-IV Criterion A1 event involving a fatality. It is described herein as the Critical Incident (CI).

The interviewer was invited to the operational debriefs held for personnel attending the incident and, with the agreement of the senior officer present, designed a second quantitative study to examine post-incident responses. As some firefighters had informally agreed to consider taking part in interviews, it was decided to offer interviews immediately following the collection of data at T1 (6 months post-incident), to minimise organisational disruption. Although data collection was originally planned for T2 to take place around the Christmas period, it was deemed inappropriate to collect it then because of the risk of anniversary reactions (Taylor & Frazer, 1982; Hull, Alexander & Klein, 2002) where symptom reporting rises (Ehlers & Clark, 2000). Accordingly data collection was carried out approximately 15 months post-incident (n = 14) at T2.

4.2.2 Participants and procedure

Participants in the group exposed to the incident (n = 23) included two whole time crews from a two-appliance station and one crew from a day-crewed station. Exposure ranged from initial exposure to body handling and to learning about the incident second hand from returning crews. Personal advisories were given to each potential participant by a fire officer several days before the survey was due to take place at T1. The FFO and the researcher attended at the fire stations and gave an explanation of the purpose of the study, the confidentiality and anonymity precautions made and the voluntary nature of participation. Due to the nature of the incident, further provisions had been made for mental health assistance, if necessary, and these were explained to the firefighters.

All of those crew members on duty when the survey was carried out agreed to participate at T1 (*n* = 23). Firefighters completed the survey and no papers were spoiled (100% completed unspoiled). Firefighters were then asked if they wished to take part in an interview and were offered the choice of participating in a group or individually. At T2, a smaller number of firefighters participated (*n* = 14). The procedure, questionnaires and measures were identical to those at T1. A group debriefing followed each of the two time points.

4.2.3 Measures

Firefighters responded to the longitudinal survey, entitled "Survey of Responses in Firefighters to Different Types of Work-Related Incidents: Incident Response, Survey 2". This survey contained a number of separate measures. These required responses by different methods, for example, through circling or ticking a statement or filling in a number on a scale. (For the full questionnaire, please see Appendix B.) The order in which the measures appeared was the same since the number of participants was considerably fewer and the Survey itself briefer.

Demographic

Firefighters were asked a number of standard demographic variables: firefighter type; gender; age; length of service; rank; previous diagnosis of a psychiatric illness for which they had received medical assistance; previous counselling or other mental health assistance; and counselling or other medical health assistance in connection with this incident.

Incident exposure

The CI was divided into two parts, referred to as the "initial attendance" and "body recovery" as some firefighters were involved in one aspect, some the second, and some both. Firefighters were asked to record the nature of their involvement by means of a "yes" or "no" response. If they answered "yes", they were asked to describe what they did. A "no" answer indicated that the firefighter respondent had not attended at either part of the incident, in which case, they were asked how they learned about the incident.

Incident response data

The firefighters were then asked whether their response to the incident involved intense fear, helplessness or horror, or any other emotional response, which they were asked to specify.

Potential cognitive predictors of PTSD

The firefighters were not asked to complete the TCQ, CTNES or HSQ in this survey in order to keep it as brief as possible and to avoid requiring firefighters who had previously completed these measures in the cross-sectional survey doing so for a second time. Instead, firefighters were asked three separate questions to which they could respond with "never", "sometimes", "often" or "always". The questions asked whether they had tried suppress thoughts of the incident when they came into the participant's mind; whether they had found themselves thinking "if only" or similar thoughts, which they would describe as regretful thoughts, in connection with this incident; and whether they had used humour in relation to this incident.

Mental health measures

The firefighters were then asked to complete the IES-R with reference to the last 7 days; the PhQ-9 the GAD 7 with reference to the last two weeks; and, the CAGE, which was adapted to include the statement, "since the incident", reflecting their alcohol use in connection with it. The firefighters were also asked whether completing the questionnaire had caused them emotional distress and whether it had been helpful to them in any way, responding with "no", "a little", "a moderate amount", "quite a lot", or "a lot".

4.2.3 Data analysis

The data were subjected to analyses investigating relationships between PTSD, depression, anxiety and alcohol misuse caseness and demographic data, previous mental health assistance, involvement in the critical incident; A2 and other emotional responses. Associations between attempted thought suppression, "if only" thoughts and the use of humour with the psychopathological conditions were also investigated. Any potential relationships between participation and caseness were explored.

4.3 Study 3: Qualitative survey

4.3.0 Introduction

The literature suggests that some incidents may be more "psychonoxous" than others (Alexander & Klein, 2001) As Meyer et al., (2012) commented "research examining predictors, and by extension, mediators of risk and resilience for PTSD and other psychological symptoms among firefighters, is limited" (p. 2). The purpose of conducting a qualitative examination into responses to the CI was to build upon the data collected in study 2, enabling a deeper exploration of the emotional responses the CI evoked and the coping mechanisms utilised. The qualitative study was carried out following data collection for Study 2 at T1 and therefore pior to T2.

4.3.1 Participants

Semi-structured focus groups were conducted with firefighters. (Guidance notes for interviews are to be found in Appendix C.) Seventeen of the 23 participants at T1 of the longitudinal survey offered to participate. The first group consisted of three firefighters who did not attend, but subsequently learned about the incident. The second consisted of 7 firefighters who all attended, the third consisted of 5 fire-firefighters, four of whom attended the incident; and the final two consisted of interviews each conducted one-on-one at the request of these participants, who had also attended the incident.

Focus groups are discussions taking place with more than one participant and involve "engaging a small number of people in an informal group discussion (or discussions), 'focused' on a particular topic or set of issues" (Wilkinson, 2008, p. 187). As opposed to an interview with one individual, a focus group is moderated by the researcher who facilitates group discussion. Citing Morgan (1997), Wilkinson (p. 187) describes the interaction amongst participants as "a key feature of focus group research – and the one which most clearly distinguishes it from one-to-one interviews."

This methodology has advantages and disadvantages, as discussed by Wilkinson (2008). Firstly, it can create a more dynamic, conversational type of communication than an interview, permitting disagreement which can enrich the data. Secondly, it permits the rapid collection of a large body of data emanating from a number of participants. However, it also requires the skills of moderation and "extremely painstaking and time-consuming" data transcription/analysis (Wilkinson, p. 189). Content analysis is a common method of analysing such data. Wilkinson also comments that

"confidentiality is a particular issue within focus groups because of the number of participants" (p. 191).

Wilkinson (2008) describes the possession of basic interviewing skills as being ideal, and the researcher, as a lawyer, has such experience. Whilst such interviews are not conducted in focus groups, she also has the experience Wilkinson (2008, p. 190) refers to as "running group discussions". Confidentiality was addressed through the obtaining of informed consent; the allocation of randomised numbers; the removal from the text of comments requested to be "off the record" or potentially identifying; and the approval of the Facilitating Fire Officer of the final data reported. All participants were given the opportunity to choose to take part (if at all) in interviews rather than groups. To ensure that participants were not subjected to stress additional to that normally experienced in their work, interviews and focus group discussions were carried out in rooms at the fire stations where they might be expected to be more comfortable and arrangements were put into place to provide additional support should any participant find himself to be distressed thereafter.

Although Wilkinson (2008) also cautions that difficulties might arise within the group due to disagreement, silence or intimidation, none of these difficulties arose in the sessions. Those who did not choose to volunteer any information were not pressed to do so, and all sessions were, in the opinion of the researcher, good-humoured.

4.3.2 Procedure

The groups were given a further information sheet and the procedure was explained verbally to them. The researcher explained that the interviews were entirely voluntary and that they were free to leave the room at any time without repercussions. She explained that the interviews would be recorded on tape and that she would introduce the subject matter and then ask questions, inviting participants to respond by raising their hand. Before they answered the question, they would identify themselves using the randomly allocated number they had selected at T1. The firefighters were told that they could choose whether or not to respond to any particular question. The researcher told the firefighters that discussion as to emotion and meaning would take place, that this would happen towards the end of the interview, reminding them that they were free to leave if they did not want to participate in this discussion. Finally, the researcher explained that the data collected on tape would be

securely stored and destroyed at the end of the overall study. The FFO did not attend the interview sessions.

Once the participants had read the Information for Participants sheets and completed Consent Forms, the interviews commenced. Each time the researcher introduced a new topic, the tape recording was stopped to allow the researcher to confirm that the participants were prepared to discuss the topic. The participants were also encouraged to ask for the tape to be stopped if they wished to speak off the record so that they could express explanatory thoughts to help the process. The recordings were transcribed by the researcher personally ensuring confidentiality. They were transcribed in total once and then each tape was listened to throughout for a second time to check for accuracy.

All interviewees were invited to discuss the role(s) they had played in the incident to provide data on their proximity and nature of exposure. A severity measure was discussed, with firefighters placing this incident on a scale from 0, being insignificant, to 10, being of the utmost significance. This was followed with discussion as to different emotions or thoughts resulting from different types of incident. Following on from these descriptions, the interviews were then themed around the three coping mechanisms of thought suppression, counterfactual thinking and humour in relation to the critical incident. As far as was possible, questions on these themes were divided into responses during and after the incident.

Although questioning prompts were provided by the interviewer, the participants elaborated on them as they wished.

4.3.3. Analysis

Several methods of qualitative analysis were considered and rejected before it was decided to use Thematic Content Analysis (TCA). These alternative methods are considered first.

Narrative analysis

Alternative methods of analysis were considered. Given that the firefighters were telling the story of their involvement in, and experience of, a critical incident, narrative analysis (Sarbin, 1986) was an obvious possibility. “A narrative can be defined as an organized interpretation of a sequence of events” (Murray, 2008, p. 113). Although the firefighter participants were telling stories of their involvement in the critical incident, narrative analysis is derived from a

theoretical position. This analysis was designed to investigate the inconsistencies in the literature regarding responses to critical incidents which render a predetermined theoretical position difficult. However, narrative analysis influenced the TCA conducted in the sense that the identification of the firefighters' stories as a group narrative was also of interest.

Interpretative Phenomenological Analysis

Interpretative Phenomenological Analysis (IPA) was considered as an analytic method as, in common with TCA, it focuses on themes or patterns. However, it requires an in-depth examination of the experience, rather than "an attempt to produce an objective statement of the object or event itself" (Smith & Osborn, 2008, p.53) and is a process in which "the participants are trying to make sense of their world; the researcher is trying to make sense of the participants trying to make sense of their world" (Smith & Osborn, 2008, p.53). IPA was not considered the appropriate approach to analysis of the interviews conducted with firefighters for three reasons.

Firstly, the aim of the qualitative investigation was to elaborate upon the quantitative data collected in the longitudinal survey, which is limited to functions performed during a critical incident and test scores for mental distress. There was no intention to analyse anything more than their experiences during and after that specific event, so the concept of making sense of it in any substantially deep manner was irrelevant. Rather, the purpose was to study the variation of responses amongst participants in an attempt to shed further light on connections between the nature of an incident, coping mechanisms used and levels of distress reported. Secondly, although IPA has been used in the analysis of groups varying in size Smith & Osborn (2008) recommend three case studies for students using IPA for the first time. This in-depth, narrow approach was not suitable for the group interviews conducted with the majority of the firefighters because of the number of them in each group and the overall number of participants, both of which were determined by operational reasons. Thirdly, there was reluctance to probe into any deeper, emotional states precisely because these firefighters had been exposed to such a horrifying event.

Grounded Theory and Discourse Analysis

Grounded theory (Glaser & Strauss, 1967) was also considered. Grounded theory builds on data collected in stages to create a theory and some of its distinguishing characteristics made it an unsuitable method of analysis for this investigation. The most notable of these are the

performance of a literature review after analysis and the collection of data, then analysis, followed by the collection of "more data around emerging themes and questions" (Charmaz, 2008, p.86). A literature review had already been undertaken and there was no possibility of collecting any further data after the interviews, so grounded theory was rejected as a method of analysis. Similarly, discourse analysis, which is concerned with the use of language to "construct versions of social reality" (Willig, 2008, p. 161), was rejected as the identification of themes in the current qualitative investigation was considered more appropriate than the use of language, given the purpose of linking quantitative data to these data.

Thematic Content Analysis

Analysis of the interviews was conducted using Thematic Content Analysis (TCA). TCA is "the most foundational of qualitative analytic procedures and in some way informs all qualitative methods", aiming to "give expression to the communality of voices across participants" (Anderson, 2007, p.1). Braun & Clarke (2006, p. 81) describe TCA as a method for discovering themes which "… can be an essentialist or realist method, which reports experiences, meanings and the reality of participants". Anderson (2007, p. 2) avers that TCA does not "suffice as a complete analysis of research findings because it is merely descriptive", and this is echoed by Braun and Clarke (2006) in identifying one potential pitfall as "the failure to actually *analyse* the data at all" (p. 94). To avoid this, the TCA for this investigation followed the guidelines set down by Braun & Clarke (2006).

Method of coding

The interviewer immersed herself in the data by transcribing the interviews and rechecking them personally, which involved repeated listening to the words and tone used. As she had also conducted the interviews herself, she was able to report on the demeanour of the firefighters during interview where appropriate. Initial codes were developed and data collected relevant to each one which permitted an exploration of potential themes as they arose. Once the themes had begun to emerge, they were labelled using a symbol of the nature of each.

The data were then assigned to the appropriate theme, and each theme was reviewed to ensure that it remained intact. Examples appropriate to each theme were included where they demonstrated both positive and negative angles. Material was excluded when it substantially reiterated data already included; where it had to be deleted as identifying of the

victim or the firefighters; or where the firefighters asked for it to be. Data were elaborated upon when they required further explanation, for example of terminology used or to reflect the demeanour observed by the interviewer. The themes were refined through the identification of sub-themes which were then introduced into the analysis. When the data were applied to the subthemes, the development of the narrative of this incident became clear. The story begins with the first theme being a Criterion A event, the constituent parts of which suggest factors which might make it psychonoxious – the subthemes of its unusual severity, the presence of both the dying and dead; and the factors which might incline a firefighter to identify with the victim. The middle of the story explains what about this incident lingered on in the firefighters' minds – how intrusive thoughts and images and counterfactual thinking played a part. The story ends with the ways in which firefighters coped with it, describing positive emotion, focus on their professional duties; their use of humour; and their perceptions of themselves.

In all stages of the narrative, firefighters compared this incident with others in which they had been involved; developing a picture of the similarities and differences between it and others.

The examples extracted as described were analysed with reference to the research questions and literature. The results were assessed by a serving fire officer for confidentiality purposes and to ensure that the themes and codes developed appeared appropriate from an operational point of view to the nature of the critical incident and the responses recorded to it.

4.4 Overall analysis

Once the results of the cross-sectional, longitudinal and qualitative surveys had been subjected to analysis, the results were considered in the light of the literature previously reviewed. The discussion thus generated follows the results chapters.

Chapter 5 : Results of cross-sectional investigation

5.0 Introduction

The literature reviewed in preceding chapters revealed that the majority of those exposed to a PTE do not go on to develop PTSD and that, although exposure to a Criterion A1 event is not the sole determinant of psychopathology, some PTEs are more 'psychonoxious' (Alexander & Klein, 2001) than others and are associated with a different conditional probability of developing PTSD (Luz et al., 2011, Kessler, et al., 1995). First responders, and specifically for the purposes of this Study, firefighters, are multiply exposed to a wide range of PTEs (e.g. Cook & Mitchell, 2013), and investigation of the potential psychonoxicity of these by incident type and accompanying firefighter reaction is warranted.

Study 1 is a cross-sectional design analysing these factors and their associations with PTSD. Because PTSD has high comorbidity with depression, anxiety and alcohol misuse, these symptoms were also investigated.

The development of this study is now described on a step-by-step basis which explains its aims, arising out of the literature review undertaken.

Step 1: Prevalence rates

The first aim was to investigate the prevalence of PTSD, depression, general anxiety disorder and alcohol misuse in a sample of UK firefighters, an investigation which does not appear to have previously been undertaken, according to the literature review. Although the reported range of prevalence rates of PTSD is wide, more rigorous diagnostic procedures result in a range of 4 – 13%% with comorbid conditions prevalent at a rate of 3.5% for moderate to severe depression ; 4.2% for moderate to severe anxiety; 10.6% for probable alcohol misuse within the last year and 25.4% during lifetime, with problematic use during lifetime indicated at 40.1% (Meyer et al., 2012).

Step 2: Pre-trauma variables as risk factors

The minority of those exposed to a PTE develop PTSD, but is unclear why (Bryant & Guthrie, 2007). There are temporal risk factors (Brewin, 2003) encompassing pre-existing vulnerabilities, the nature of and subjective response to the PTE, and the coping mechanisms, environment and relationships an exposed individual experiences after a PTE. Identification of these vulnerabilities through meta-analyses (Brewin et al., 2000; Ozer et al.,2003), systematic review (DiGangi et al., 2013) and international review on firefighters (Cook & Mitchell, 2013) permitted the determination of pre-PTE

risk factors for Study 1 as gender, lack of education, previous and family psychiatric history, prior trauma, youth and single status.

As discussed in Chapter 2, the literature raises questions concerning whether greater vulnerability is inherent in females or whether females in some professions, such as the military and first responders are less vulnerable; whether marital status and previous divorce are protective or not; whether having children increases vulnerability when child victims are involved in incidents; and whether prior military service increases vulnerability in firefighters. Thus, these variables were included in study 1.

Step 3: Occupational variables as risk factors

As discussed in Chapter 2, occupational risk factors for first responders have been identified in the literature in respect of age, length of service, rank and training, but the associations between these variables and PTSD caseness are complex and inconsistent. As age may be a proxy for greater exposure, study 1 included only length of service as a variable.

Step 4: Exposure to Criterion A1 events and A2 responses as risk factors

The literature reviewed at Chapter 2 revealed that the risks for firefighters of developing psychopathology seem intertwined; there does not appear to be a strict linear relationship between exposure and symptomatology in firefighters; individuals' experience of events varies and is affected by personal vulnerabilities.

Because risks associated with both multiple exposure and intensity of exposure are not comprehensively determined, study 1 first incorporated the major critical incidents of fire and road traffic collisions (RTCs) and provided an 'other category' for less common CIs. A category was included for 'persons trapped/reported' as this is a feature of the information provided to UK firefighters on call-out, alerting them to this dangerous situation. Since the study was performed, Jacobsson et al., (2013) have reported that persons trapped in RTCS were of particular psychological difficulty for firefighters.

Secondly, the Study incorporated elements of exposure which appear potentially 'psychonoxious' from the literature. Participants responded to these questions with broad estimates of their exposure to each.

Thirdly, in order to determine whether there were elements of CIs which made them particularly memorable, participants were then asked to answer a series of questions about an incident they remembered well.

Given that the literature reviewed in Chapter 2 is inconclusive as to the predictive effect of the Criterion A2 responses of intense fear, helplessness or horror for firefighters, these were included as variables.

Step 5: Cognitive processes as risk factors

The final step with regard to associations between variables of risk and symptomatology was to investigate those between three cognitive processes used and such symptoms. The models of PTSD discussed in Chapter 1 and the literature reviewed in Chapter 2 formed the basis of this investigation into thought control, counterfactual thinking and humour style.

Step 6: Multiple regression

Once associations between the variables discussed and development of symptomatology of all four conditions had been established, a multiple regression analysis was undertaken, as described further below.

5.1 Research questions for study 1

On the basis of the literature reviewed in the preceding chapters and summarised here, the research questions for study 1 are as follows:

(1) What is the prevalence rate of PTSD, depression, general anxiety disorder and alcohol misuse in a sample of UK firefighters?

(2) To what extent are the predictors of pre-trauma vulnerability previously identified in the general population and in first responders also predictive of PTSD in this sample?

(3) Is there a relationship between the nature of a Criterion A1 event experienced by a firefighter and their responses to mental health measures across different types of critical incident?

(4) Is there a relationship between specific elements of one Criterion A event which a firefighter remembers well and responses to mental health measures?

(5) Is there a relationship between the Criterion A2 responses of intense fear, helplessness and horror and prevalence of the four mental health conditions?

(6) Is there a relationship between the cognitive processes of thought control, counterfactual thinking and humour style and does this predict development of the four mental health conditions?

(7) Insofar as relationships between these variables and the four conditions are found, which are predictive of the conditions on multiple regression?

(8) Which predictors of risk and resilience can therefore be determined within this sample of UK firefighters?

5.2 Results of study 1

The sample in this study comprised 154 firefighters (94.8% males, 5.2% females) with a range of different ranks (72.7% Firefighter, 14.3% crew commander, 11% watch commander and 1.3% officer) and years of service (22.7% 0-5 years, 21.6% 6-10 years, 26.6% 11-17 years, 28.6% over 17 years). The majority (75.3%) were living with a partner, or were otherwise single (18.2%) or separated (5.2%), had no previous divorce (72.7%), and had children (57.8%). The majority of the participants described themselves as white Caucasian (96.1%) and 16.9% had obtained a university degree. A total of 13.6% had completed prior military service. Seven participants (4.5%) reported a disability.

First of all, the prevalence of symptomatology was considered across the sample. The initial set of analyses considered how scores on the mental health measures varied according to the three sets of potential predictors: pre-trauma demographic information, Criterion A exposure and response, and cognitive factors (thought control, counterfactual thinking and humour style). The relationships between all mental health measures and all individual factors were examined separately. Finally, a multiple regression was conducted to examine the extent to which these factors could predict vulnerability to each of the four conditions.

5.2.1 Mental health measures

The firefighters completed the IES-R, PHQ-9, GAD-7 and CAGE Scores on each of these measures are shown below. The incidence of probable PTSD as measured by the IES-R is shown in Figure 5.1 below.

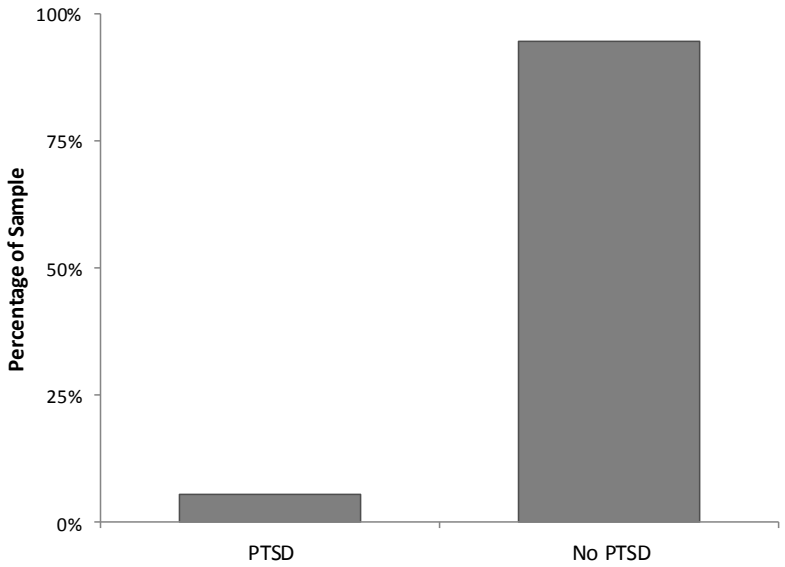

Figure 5.1: Diagnosis of PTSD symptomatology across sample

A total of 8 out of 150 (5.3%) participants in the sample reached the cut-off point for a probable diagnosis of PTSD (with a score of ≥ 33).

The incidence of depression in this sample was measured according to the PHQ and is shown in Figure 5.2 below.

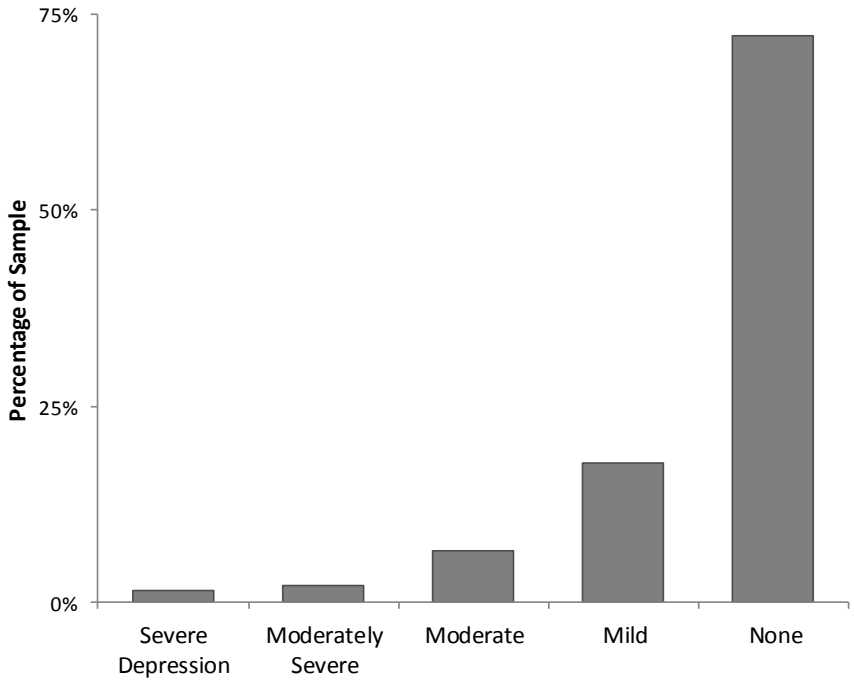

Figure 5.2: Diagnosis of depression symptomatology across sample

The cut-off points are given by the PHQ-9 as scores of ≥2 0 associated with severe depression; 15-19 with moderately severe; 10-14 with moderate; 5-9 with mild; and 1-4 with no depression. Using these cut-off points, 2 people (1.3%) reached the level of severe depression; 3 (2.0%) were moderately severe; 10 (6.6%) were moderate; 27 (17.8%) were mild and 110 (72.4%) had no depression.

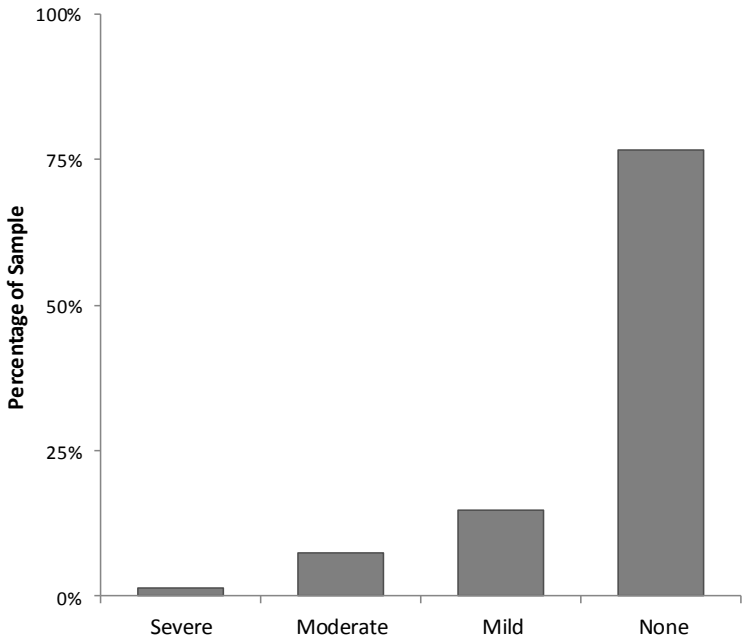

Figure 5.3: Diagnosis of generalised anxiety disorder symptomatology across sample

The cut-off points for severity of generalised anxiety disorder according to GAD are 15 for severe; 10 for moderate and 5 for mild. Using these cut-off points, 2 people (1.3%) reached the level of severe anxiety; 11 (7.3%) were moderate, 22 (14.6%) were mild and 116 (76.8%) had none.

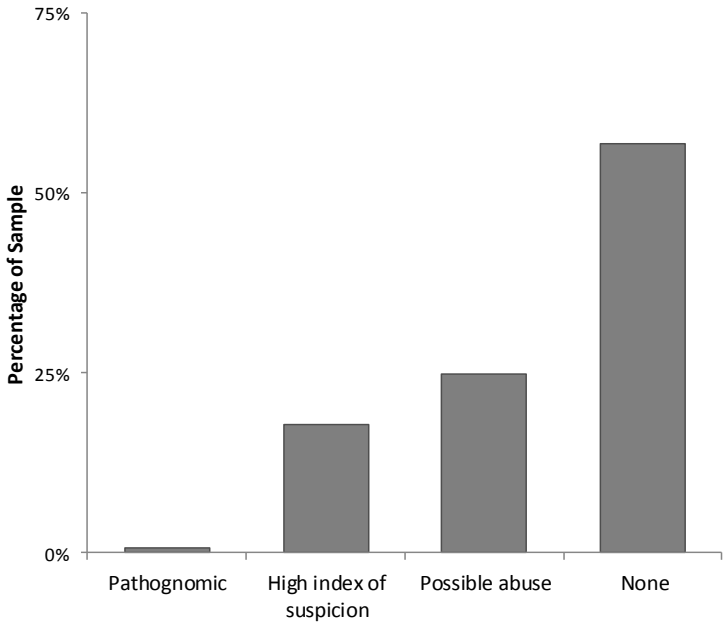

Figure 5.4: Diagnosis of alcohol misuse symptomatology across sample

Four affirmative answers to all questions on the CAGE questionnaire are deemed pathognomic for alcoholism and two or three to create a high index of suspicion. Following Chung et al., (2000) and Meyer et al., (2012), those with a score of 1 indicate possible abuse. Thus, in this sample, 1 person (0.7%) was pathognomic for alcohol misuse; 27 (17.7%) reached the level of a high index of suspicion (probable abuse, Meyer et al., 2012); 38 (24.8%) indicated possible abuse and 87 (56.9%) indicated none.

5.2.2 Summary

A total of 5.3% reached the criteria for a probable diagnosis of PTSD and 94.7% did not. This rate of symptomatology is greater than that of the UK Adult Psychiatric Morbidity Study (2007) for the general population but is low for firefighters according to Meyer et al (2012). Moderate to severe depression was found in 9.9% of the sample. Adapting the scores obtained from the PHQ-9 to the BDI-II, such that “moderately severe” on PHQ-9 might correspond with “moderate” or “severe” on the BDI-II, (Kung et al., 2013), a prevalence rate of depression is produced of 3.29%, consistent with scores obtained with US firefighters using the BDI-II (Meyer et al.,2012).

Rates for generalised anxiety disorder were 8.6% for moderate to severe GAD, again higher than for the UK general population, and higher than the 4.2% of firefighter participants (Meyer et al., 2012) using the BAI (Beck, Epstein, Brown & Steer, 1988).

Finally, rates of probable alcohol misuse (CAGE ≥ 2) were reported by 17.7% of participants, while rates of possible misuse (CAGE ≥ 1) were found in 24.8% of the sample. These rates are similar to

those found in the UK general population of 24.3% for hazardous drinking. Meyer et al., (2012) found a probable alcohol misuse rate within the past year in US firefighters of 10.6% and possible misuse at 22.5%, while lifetime probable misuse was observed in 25.4% of participants and lifetime possible abuse in 40.1%.

5.2.3 Demographic data

The next set of analyses considered how mental scores differed across a range of demographic data for the 154 participants: firefighter type, gender, marital status, previous divorce, children, qualifications, length of service, rank, location of fire station, ethnic origin, reported disability and previous military service. Table 5.1 summarises raw standard demographic data and Table 5.2 summarises raw occupational demographic data.

Because the data were not normally distributed, the data were transformed before any inferential tests were conducted using the square root transformation. They were then found to be normally distributed, with skewness ratings below 1 for IES (.71), PHQ (.47), GAD (.77), and CAGE (.58).

Most of the differences in mental health outcomes were not found to be significant within these variables ($F < 1.84$, $p > .05$). However, CAGE scores were found to differ such that those who had been previously divorced had higher scores than those who had not; $t(85.70) = 2.80$, $p = .006$. Further, IES scores were also found to differ across the level of qualification obtained; $F(7, 148) = 2.51$, $p = .019$. A post-hoc analysis conducted with the Bonferroni adjustment revealed that those with a postgraduate degree had higher IES scores than those with an NVQ ($p = .043$), and those with A-level qualifications had higher IES scores than those with an undergraduate degree ($p = .017$). No other significant differences were found.

Those with a previous psychiatric diagnosis had higher GAD scores; $t(145) = -2.26$, $p =.025$,and higher CAGE scores; $t(10.858) = -4.357$, $p = .001$, than those without. It is worth noting that very few participants gave a positive response to the questions enquiring about being prescribed medication for psychiatric disorders ($n = 10$, 6.49%), and for receiving counselling ($n = 27$, 17.53%). However, those that had received psychiatric medication in the last year and during service had significantly higher IES scores than those who did not; $t(8) = -2.70$, $p = .027$.

With regard to occupational demographic data, significant differences were found for firefighter type between PHQ scores; $F(3,150) = 4.85$, $p = .003$. Posts hoc tests using the Bonferroni adjustment revealed that 'Day Crew' members had higher PHQ scores than 'Whole time' crew members (p = .002) and 'Retained' crew members ($p = .005$). Similarly, significant differences were found between GAD scores; $F(3,149) = 5.05$, $p = .002$. Again, 'Day crew' members had significantly higher GAD scores

then ‘Whole time’ crew memebrs (p = .001) and ‘Retained’ crew members (p = .014*).* No other significant differences were found between the groups (F < 1.839*,* p > .05).

5.2.4 Summary

Previously divorced firefighters had significantly lower scores indicating lower alcohol misuse. Firefighters with post-graduate and A-level educational qualifications had significantly higher PTSD scores than those with NVQ and undergraduate qualifications respectively. Firefighters with a previous psychiatric diagnosis were found to have higher anxiety scores those who had not, and those who had received psychiatric medication in the last year and during service had higher PTSD scores than those who had not. Finally, firefighters working as ‘Day crew’ had significantly higher depression and anxiety scores than both ‘Whole time’ and ‘Retained’ firefighters.

Table 5.1: Summary of raw descriptive statistics for demographic data (means and standard deviations)

Variable		n	IES	n	PHQ	n	GAD	n	CAGE
Gender	Male	143	8.75 *(12.68)*	145	3.28 *(4.27)*	144	2.69 *(4.16)*	146	0.71 *(.96)*
	Female	6	3.83 *(4.92)*	6	4.83 *(6.40)*	6	2.83 *(3.19)*	6	0.50 *(1.22)*
Marital status	Single	26	10.23 *(15.00)*	27	3.22 *(3.66)*	27	2.52 *(3.99)*	28	0.39 *(0.73)*
	Living with partner	115	7.61 *(11.29)*	116	3.34 *(4.50)*	115	2.86 *(4.25)*	116	0.78 *(1.03)*
	Separated	8	16.63 *(17.93)*	8	3.88 *(5.00)*	8	0.88 *(1.73)*	8	0.63 *(0.52)*
Divorce history	Previously divorced	39	10.23 *(10.66)*	40	3.85 *(4.57)*	39	2.79 *(4.23)*	40	0.38 *(0.70)*
	Not previously divorced	110	7.95 *(11.07)*	111	3.16 *(4.29)*	111	2.66 *(4.10)*	112	0.81 *(1.03)*
Children	Children	89	7.72 *(11.56)*	89	3.11 *(4.60)*	89	2.46 *(4.12)*	89	0.73 *(1.00)*
	No children	57	9.93 *(14.05)*	59	3.64 *(4.08)*	58	2.98 *(4.22)*	60	0.63 *(0.90)*
Qualifications	None	2	12.00 *(14.14)*	2	3.00 *(2.83)*	2	0.50 *(0.71)*	2	0.50 (0.71)
	NVQ	20	4.70 *(6.95)*	20	3.05 *(4.41)*	20	2.65 *(4.06)*	20	0.25 (0.*72)*
	Diploma	3	7.67 *(12.42)*	3	4.00 *(4.58)*	3	7.00 *(6.25)*	3	0.67 *(0.58)*
	GCSE	62	7.10 *(8.93)*	64	2.94 *(3.69)*	63	2.44 *(3.88)*	64	0.77 *(0.92)*
	A level	24	16.67 *(19.06)*	24	4.00 *(3.36)*	24	2.92 *(3.22)*	24	0.75 *(1.11)*
	Undergrad	18	2.94 *(4.84)*	18	3.94 *(5.90)*	18	2.72 *(5.46)*	19	0.58 *(0.90)*
	Postgrad	7	8.57 *(9.86)*	7	1.71 *(1.60)*	7	1.86 *(2.85)*	7	1.71 *(1.38)*
	Other	13	13.85 *(19.37)*	13	4.54 *(7.31)*	13	3.31 *(5.22)*	13	0.62 *(0.96)*
Medical Assistance	No	4	2.5 *(2.38)*	4	1.25 (2.50)	4	0.25 (0.50)	4	0.50 (0.58)
	Last month	17	14.71 *(15.73)*	17	5.24 (4.44)	17	5.30 (5.86)	17	1.24 (1.10)
	Last 6 months	25	5.12 *(7.51)*	25	3.08 (3.24)	25	2.92 (3.08)	25	0.96 (1.21)
	Last year	40	12.08 *(16.80)*	40	3.80 (5.23)	40	2.95 (3.95)	40	0.75 (1.06)
	During service	86	10.13 *(14.43)*	86	3.76 (4.51)	86	3.28 (4.20)	86	0.90 (1.10)
Psychiatric diagnosis	Diagnosis	10	6.4 (9.17)	10	4.3 (3.62)	10	5.00 (5.46)	10	1.80 (1.03)
	No diagnosis	136	8.99 (12.85)	138	3.33 (4.47)	137	2.61 (4.03)	139	0.61 (0.90)
Prescribed medication	Within last year	5	0.40 (0.89)	5	4.20 (3.03)	5	3.40 (2.41)	5	1.20 (1.10)
	During service	5	12.2(11.84)	5	3.80 (4.44)	5	2.40 (3.29)	5	1.40 (1.34)
Counselling	Last month	2	27.50 (38.89)	2	4.50 (2.12)	2	3.00 (4.24)	2	2.00 (1.41)
	Last 6 months	2	20.50 (2.12)	2	6.50 (3.54)	2	7.50 (6.36)	2	1.00 (0.00)
	Last year	4	0.00 (0.00)	4	2.00 (2.83)	4	1.50 (1.91)	4	0.50 (0.58)
	During service	19	12.11 (18.27)	19	6.63 (6.60)	19	5.42 (5.75)	19	1.11 (1.29)

Disability	No	143	8.22 (12.35)	145	3.38 (4.39)	144	2.67 (4.14)	146	0.68 (0.95)
	Yes	7	17.43 (13.44)	7	3.43 (4.31)	7	3.71 (3.77)	7	1.14 (1.21)

Table 5.2: *Summary of descriptive statistics for firefighter demographics (means and standard deviations)*

Variable		**N**	**IES**	**N**	**PHQ**	**N**	**GAD**	**N**	**CAGE**
Firefighter type	Whole time	96	8.00 *(11.51)*	97	2.74 *(3.48)*	97	2.20 *(3.57)*	98	0.60 *(.86)*
	Retained	32	7.97 *(10.95)*	32	3.34 *(4.94)*	32	2.72 *(4.62)*	32	0.84 *(1.14)*
	Day crew	9	11.00 *(19.77)*	10	8.20 *(6.21)*	9	7.44 *(5.98)*	10	1.40 *(1.17)*
	Whole time & retained	12	12.67 *(17.54)*	12	4.17 *(5.25)*	12	3.08 *(3.37)*	12	0.50 *(1.00)*
Length of service	0-5 years	33	7.67 *(11.02)*	34	3.12 *(3.83)*	34	2.09 *(3.46)*	35	0.54 *(0.89)*
	6-10 years	33	12.76 *(16.79)*	33	4.24 *(5.52)*	33	3.15 *(4.00)*	33	0.58 *(0.90)*
	11-17 years	41	5.85 *(9.35)*	41	2.10 *(2.83)*	41	2.73 *(3.85)*	41	0.78 *(1.15)*
	17+ years	43	8.91 *(11.94)*	44	4.14 *(4.79)*	43	2.88 *(4.94)*	44	0.84 *(0.89)*
Rank	Firefighter	109	8.71 *(12.03)*	111	3.39 *(4.20)*	110	2.85 *(4.27)*	112	0.71 *(0.99)*
	Crew commander	22	9.91 *(16.71)*	22	3.73 *(5.85)*	22	2.77 *(4.41)*	22	0.55 *(0.80)*
	Watch commander	17	5.82 *(8.96)*	17	2.76 *(3.44)*	17	1.82 *(2.67)*	17	0.82 *(1.07)*
	Officer	2	15.50 *(16.26)*	2	4.50 *(4.95)*	2	3.00 *(4.24)*	2	0.50 *(0.71)*
Station location	Urban	115	8.90 *(12.91)*	117	3.38 *(4.19)*	116	2.64 *(3.75)*	117	0.68 *(0.92)*
	Semi-rural	32	7.50 *(11.40)*	32	3.66 *(5.14)*	32	2.97 *(5.35)*	33	0.73 *(1.10)*
	Rural	3	11.33 *(10.26)*	3	0.67 *(1.15)*	3	3.33 *(4.04)*	3	1.00 *(1.73)*
Ethnicity	White	145	8.37 *(12.10)*	147	3.47 *(4.41)*	146	2.82 *(4.16)*	148	0.71 *(0.98)*
	Mixed race	2	9.50 *(3.54)*	2	0.00 *(0.00)*	2	0.00 *(0.00)*	2	0.50 *(0.71)*
	Black	2	4.50 *(3.54)*	2	0.50 *(0.71)*	2	0.00 *(0.00)*	2	0.00 *(0.00)*
Military service	Prior military service	21	14.00 *(19.88)*	21	4.76 *(6.04)*	21	3.43 *(4.87)*	21	0.57 *(0.81)*
	No prior military service	128	7.84 *(10.74)*	130	3.18 *(4.03)*	129	2.63 *(4.00)*	131	0.72 *(0.99)*

5.2.5 Exposure

Frequency of exposure to critical incidents

Firefighters reported their estimated frequency of exposure to various types of incidents. The difference in mental health scores for post-traumatic stress disorder (IES-R) depression (PHQ-9), anxiety (GAD 7) and alcohol dependency (CAGE) were considered according to total scores of frequency of exposure to these categories of incidents during service. Table 5.3 summarises these data below.

Table 5.3: Exposure to critical incidents

Level of Exposure	N	Min	Max	Mean	SD	Median
Total Road traffic collisions	150	0	3000	217.7	355.6	100
Total Fire	148	1	5000	546.5	929.0	200
Total Other incidents	97	4	10000	1149.6	1994.3	400
Persons trapped in: Road traffic collisions	140	0	1000	113.5	163.0	60
Persons trapped in: Fire	139	0	1600	103.8	229.8	30
Persons trapped in: Other	80	0	5000	216.7	703.9	40
Fatal injury to public	147	0	200	21.7	30.9	10
Serious injury to public	144	0	5000	118.9	446.0	50
Serious injury to colleague	145	0	20	1.9	3.7	0
Fatal injury to colleague	147	0	8	1.0	1.6	0
Serious injury to you	145	0	10	0.4	1.1	0
Perceived danger to you	144	0	5000	86.5	435.7	5
Perceived danger to colleague	142	0	5000	162.2	610.1	6
Perceived danger to public	139	0	4200	235.4	678.1	32
Body recovery of colleague	143	0	8	0.2	0.9	0
Body recovery of civilian	149	0	200	17.0	27.4	9

Given the skewed nature of the exposure variables, a Spearman's correlational analysis was used. Largely, there were no significant correlations between exposure to the critical incidents and mental health scores ($p > .05$), with the following exceptions: Positive correlations were found between CAGE scores and experiencing road traffic collisions ($r = .17$, $n = 150$, $p = .036$), a serious injury to a colleague ($r = .21$, $n = 145$, $p = .012$), a perceived danger to the participant ($r = .24$, $n = 144$, $p = .004$), a perceived danger to a colleague ($r = .22$, $n = 142$, $p = .009$), and a perceived danger to members of the public ($r = .21$, $n = 139$, $p = .012$). Similarly, Spearman's correlations were found between GAD scores and perceived danger to persons trapped in critical incidents other than road traffic collisions or fires ($r = .24$, $n = 78$, $p = 0.033$), and serious injury to a colleague ($r = .20$, $n = 143$, $p = .019$).

The incident firefighters remembered well

The firefighters were asked to think of an incident that they remembered well and to record whether an element had ("Yes") or had not ("No") been involved in that specific incident. Table 5.4 reports the mean scores for IES, PHQ, GAD and CAGE for each of the elements involved. A series of independent t-tests were conducted to measure the differences in IES, PHQ, GAD and CAGE between positive and negative responses. For these tests, square-root transformations were again used for all measures (IES, PHQ, GAD and CAGE) and all t-test results were corrected for inequality of variances. No significant differences ($t < 1.676$, $p > 0.05$) were found for the majority of the comparisons, but a few exceptions are reported here. Those whose incident included the death of a colleague reported significantly higher scores on the PHQ than those whose incident did not; $t(145) = -2.03$, $p = .044$, and also higher GAD scores; $t(144) = -2.72$, $p = .007$. Those whose incident included serious injury to a colleague scored higher on PHQ; $t(145) = -3.53$, $p = .001$,and higher on GAD; $t(144) = -2.84$, $p = .005$. Finally, those whose incident involved threatened serious injury to the participant had higher PHQ scores; $t(145) = -2.15$, $p = .033$.

Summary of exposure data

Greater levels of alcohol misuse were reported in those firefighters who had been exposed to RTCs; injury and perceived danger to their colleagues and members of the public. Greater levels of anxiety were experienced by firefighters exposed to CIs involving persons trapped in circumstances other than in fires or road traffic collisions (RTCs).

When focusing on the incident the firefighters remembered well, more depression and anxiety were both experienced where death or serious injury had been sustained by a colleague. Increased depression was also suffered where the firefighter him/herself had been threatened with serious injury during the CI.

Table 5.4: Raw mental health measures between those with and without specific exposure factors in the incident they remembered well

Did the incident include:		**N**	**IES**	**N**	**PHQ**	**N**	**GAD**	**N**	**CAGE**
Death of civilian	Yes	133	8.88 (12.32)	134	3.40 (4.33)	133	2.80 (4.14)	134	0.72 (0.97)
	No	13	4.08 (4.77)	13	4.00 (5.46)	13	2.46 (4.61)	13	0.62 (1.12)
Death of colleague	Yes	18	11.56 (18.69)	18	5.89 (6.87)	18	5.17 (5.73)	18	0.94 (1.21)
	No	128	8.02 (10.67)	129	3.11 (3.88)	128	2.43 (3.81)	129	0.67 (0.95)
Serious injury to you	Yes	3	8.33 (14.43)	3	1.00 (1.00)	3	1.33 (1.15)	3	1.00 (1.00)
	No	143	8.45 (11.92)	144	3.51 (4.45)	143	2.80 (4.20)	144	0.70 (0.98)
Serious injury to civilian	Yes	111	9.13 (13.07)	111	3.37 (4.35)	111	2.77 (3.99)	111	0.77 (0.99)
	No	35	6.31 (6.84)	36	3.72 (4.68)	35	2.80 (4.75)	36	0.53 (0.94)
Serious injury to colleague	Yes	14	12.43 (16.99)	14	7.71 (7.35)	14	5.71 (6.23)	14	1.00 (1.24)
	No	132	8.03 (11.26)	133	3.01 (3.76)	132	2.46 (3.79)	133	0.68 (0.95)
Threatened death or serious injury to you	Yes	19	11.89 (15.34)	19	5.84 (6.69)	19	4.47 (6.10)	19	0.63 (0.90)
	No	127	7.94 (11.30)	128	3.10 (3.89)	127	2.52 (3.76)	128	0.72 (1.00)
Threatened death or serious injury to civilian	Yes	69	8.71 (13.71)	69	2.94 (3.99)	69	2.22 (3.36)	69	0.87 (1.08)
	No	77	8.22 (10.13)	78	3.91 (4.75)	77	327 (4.75)	78	0.56 (0.86)
Threatened death or serious injury to colleague	Yes	29	9.48 (13.78)	29	4.38 (4.99)	29	3.21 (3.89)	29	0.83 (1.07)
	No	117	8.20 (11.46)	118	3.23 (4.26)	117	2.67 (4.24)	118	0.68 (0.96)

5.2.6 Criterion A2 Responses to exposure to critical incidents

The firefighters' first responded to the question: *'If you have experienced an event or events that involved actual or threatened death or serious injury to anyone during your service, did your response to this event (or these events) involve intense fear, helplessness or horror?'* Responses were indicated by ticking one of four boxes labelled 'Never', 'Sometimes', 'Often' and 'Always'. No firefighter recorded the response 'Always'. One way ANOVAs were used to test the difference in mental health scores across frequency of the responses. The results of these analyses appear in Table 5.5 below.

Table 5.5: Criterion A2 responses to occupational exposure

		Never		**Sometimes**		**Often**		F	p
		n	M (SD)	n	M (SD)	n	M (SD)		
Fear	IES	109	7.07(11.39)	33	12.70 (13.43)	3	23.67 (30.66)	5.06	.008**
	PHQ	110	3.29 (4.39)	33	3.64 (4.29)	3	5.33 (5.86)	0.49	.612
	GAD	109	2.32 (3.83)	33	3.55 (4.18)	3	7.00 (10.44)	2.81	.064
	CAGE	110	0.92 (0.09)	33	1.03 (0.95)	3	0.67 (1.15)	3.88	.023*
Helplessness	IES	80	5.31 (10.10)	60	10.56 (11.37)	6	34.50 (21.88)	15.04	.001**
	PHQ	80	2.99 (4.49)	60	3.53 (4.22)	7	6.29 (3.59)	3.30	.040*
	GAD	80	2.26 (3.85)	60	2.96 (4.24)	6	5.50 (5.65)	1.92	.150
	CAGE	80	0.46 (0.83)	60	0.90 (1.02)	7	1.29 (0.95)	6.39	.002**
Horror	IES	86	6.88(11.73)	55	10.25 (11.97)	3	31.33 (29.67)	3.81	.024*
	PHQ	86	3.51 (4.88)	56	3.07 (3.49)	3	7.00 (3.46)	1.46	.236
	GAD	86	2.60 (4.20)	55	2.71 (4.09)	3	5.67 (3.21)	1.63	.199
	CAGE	86	0.55 (0.86)	56	0.91 (1.03)	3	0.67 (1.15)	2.31	.103

* $p < .05$; **, $p < .01$, *** $p < .001$.

Significant differences were found for intense fear on IES; $F(2,144) = 5.06$, $p = .008$, with significance between the 'Never' and 'Sometimes' ($p = .029$). For CAGE; $F(2,145) = 3.88$, $p = .023$, with significance between 'Never' and 'Sometimes' ($p = 0.018$).

Significant differences were found for helplessness on IES: $F(2,145) = 15.04$, $p < .001$, with significance lying between 'Never' and 'Sometimes', ($p = .002$); and 'Never' and 'Often', ($p < .001$). Helplessness was also significant for PHQ; $F(2,146) = 3.30$, $p = .04$ with significance lying between 'Never' and 'Often' ($p = .042$). Finally, helplessness was also significant for CAGE; $F(2,146) = 6.40$, $p = .002$ with significance lying between 'Never and 'Sometimes' ($p = .016$, and 'Never' and 'Often' (p=.025).

Significant differences were found for horror on IES; $F(2,143) = 3.81$, $p = .024$).

Secondly, the firefighters responded to the question: *"Have you experienced, witnessed or been confronted with an event or events that involved actual or threatened death or serious injury to anyone outside of your service as a firefighter?"* If the firefighters had been involved in an event or events which involved actual or threatened death or serious injury to anyone outside of their service as a firefighter, they were asked to fill in an estimated number from zero upwards showing how many times they had been so exposed. The relationship between the number of these events and scores on the mental health measures was considered, and no significant correlations were found.

Again, responses to how often they felt 'Fear', 'Helplessness' and 'Horror' were indicated by ticking the four boxes 'Never', 'Sometimes', 'Often' and 'Always'. In the dataset, only a small number of participants responded with 'Always' (*n* = 4, 4 and 2, for the Fear, Helplessness and Horror questions respectively). Therefore, to improve statistical reliability, all 'Always' responses were collapsed with the 'Often' responses. The data and all significant findings are highlighted in Table 5.6.

Table 5.6: Criterion A2 responses to non- occupational exposure

		Never		**Sometimes**		**Often / Always**		F	p
		n	M (SD)	n	M (SD)	n	M (SD)		
Fear	IES	59	8.58 (11.24)	24	14.21 (18.84)	6	10.83 (12.40)	0.89	.415
	PHQ	60	3.32 (4.32)	24	4.58 (4.35)	6	2.83 (2.56)	0.82	.444
	GAD	59	2.46 (4.28)	24	3.46 (5.22)	6	2.83 (1.60)	1.16	.317
	CAGE	60	0.55 (0.85)	24	1.13 (1.03)	6	2.17 (0.75)	9.42	.001***
Helplessness	IES	44	6.98 (10.44)	41	12.32 (14.93)	9	15.67 (18.07)	2.44	.093
	PHQ	44	3.16 (4.55)	41	3.73 (3.95)	10	4.80 (3.61)	1.60	.207
	GAD	44	2.11 (4.30)	41	3.32 (4.65)	9	2.89 (2.76)	2.38	.098
	CAGE	44	0.64 (.89)	41	0.80 (1.01)	10	1.70 (1.16)	3.90	.024*
Horror	IES	49	7.33 (10.66)	35	13.51 (17.13)	4	16.25 (11.79)	2.57	.082
	PHQ	50	3.52 (4.76)	35	4.51 (4.11)	4	1.25 (0.96)	1.73	.183
	GAD	49	2.35 (4.32)	35	3.66 (5.02)	4	2.25 (0.50)	1.35	.265
	CAGE	50	0.54 (0.84)	35	1.06 (1.06)	4	2.25 (0.50)	7.18	.001**

* $p < .05$; **, $p < .01$, *** $p < .001$.

There was a significant difference for CAGE on fear outside of the firefighters' occupational exposure, $F(2,89) = 9.42$, $p < .001$, with significance between 'Never' and 'Sometimes'($p = .035$) and 'Never' and 'Often' ($p = .001$). A significant difference was found for CAGE on helplessness outside work, $F(2,94) = 3.90$, $p = .024$ with significance lying between 'Often' and 'Never' ($p = .013$). There was a significant difference for CAGE on horror outside work, $F(2,88) = 7.18$, $p = .001$, however

Bonferroni tests revealed differences between 'Never' and 'Sometimes' (p = .047) and 'Never' and 'Often' (p = .005).

Summary of A2 responses

During occupational exposure, more symptomatology of PTSD was reported in relation to higher levels of intense fear, helplessness and horror; more symptomatology of depression was reported again in relation to higher levels of intense fear and helplessness; and more symptomatology of alcohol misuse was reported in relation to intense fear and helplessness. Anxiety was not associated with any A2 response. During non-occupational exposure, more symptomatology of alcohol misuse was reported in relation to higher levels of intense fear and horror.

5.2.7 Association of humour style, thought control and counterfactual thinking with mental health scores

Bringing to mind the incident they remembered well, firefighters completed the TCQ, CTNES, HSQ and HSQX questionnaires. The relationships between scores on these questionnaires and mental health measures (IES-R, PHQ-9, GAD 7, and CAGE) are reported across Tables 5.7 and 5.8. As before, square root transformations were made for the mental health measures (PHQ, GAD, CAGE, and IES with all sub scales), though all other measures TCQ, CTNES, and all varieties of the HSQ were not improved by transformation, so original non-transformed scores on these other measures and their subscales were used.

The first analyses test how the mental health measures related to each other. A summary of Pearson's bivariate correlations are given in table 5.7 below.

Table 5.7: Relationships between all mental health measures

	IES-A	**IES-I**	**IES-H**	**IES**	**PHQ**	**GAD**	**CAGE**
IES-A	1						
IES-I	.779**	1					
IES-H	.640**	.729**	1				
IES	.925**	.945**	.779**	1			
PHQ	.251**	.223**	.345**	.263**	1		
GAD	.252**	.191*	.333**	.251**	.687**	1	
CAGE	.104	.144	.151	.142	.186*	.233**	1

Note: IES-A =IES Avoid; IES-I = IES Intrusion; IES-H = IES Hyper Arousal; IES = IES Total; PHQ = PHQ Total; GAD = GAD Total; CAGE = CAGE Total; * p < .05; **, p <.01, *** p < .001.

Since the IES-R subscales correlated highly with each other and with the total score, the IES-R total scores only were used in further analysis, as recommended by Wagner (2011) in firefighter studies. All variables were tested for skewness but all were found to be normally distributed, with skewness ratings all below 1; TCQ (.736), CTNES (.775), HSQ Original (-.062), HSQ X Original (-.112), HSQ with Black (.074), and HSQ X with Black (.022).

Table 5.8: Correlational table showing relationships between cognitive coping constructs

	TCQ-D	TCQ-S	TCQ-W	TCQ-P	TCQ-R	CTNES-NRD	CTNES-ORU	CTNES-SRU	CTNES-NRU	HSQ-AF	HSQ-SE	HSQ-AG	HSQ-SD	HSQ-B	HSQX-AF	HSQX-SE	HSQX-AG	HSQX-SD	HSQX-B
TCQ-D	1																		
TCQ-S	-.19*	1																	
TCQ-W	.58**	-.07	1																
TCQ-P	.41**	-.24**	.50**	1															
TCQ-R	.58**	-.04	.46**	.44**	1														
CTNES-NRD	.34**	.01	.36**	.25**	.34**	1													
CTNES-ORU	.29**	-.04	.37**	.31**	.28**	.37**	1												
CTNES-SRU	.34**	.04	.42**	.48**	.34**	.48**	.38**	1											
CTNES-NRU	.37**	-.09	.41**	.46**	.48**	.46**	.44**	.63**	1										
HSQ-AF	-.06	.11	-.15	-.08	-.12	-.12	-.01	-.08	-.1	1									
HSQ-SE	.15	.08	.04	.06	.032	.06	.22**	.06	.07	.40**	1								
HSQ-AG	.050	.06	.044	.09	.011	-.08	.21*	.08	.12	.27**	.34**	1							
HSQ-SD	.26**	.00	.36**	.31**	.20*	.10	.22**	.21**	.28**	.08	.13	.27**	1						
HSQ-B	.11	-.14	.04	.05	.04	-.00	.13	-.02	-.00	.31**	.25**	.44**	.27**	1					
HSQX-AF	-.01	.14	-.09	-.04	-.12	-.08	-.05	-.00	.02	.77**	.35**	.15	.02	.09	1				
HSQX-SE	.13	.03	.08	.11	.04	.17*	.28**	.08	.12	.25**	.86**	.24**	.14	.09	.35**	1			
HSQX-AG	.09	-.05	.11	.12	.04	-.01	.21**	.12	.20*	.20*	.30**	.85**	.30**	.35**	.16	.27**	1		
HSQX-SD	.28**	-.07	.36**	.32**	.18*	.15	.27**	.24**	.32**	.10	.24**	.31**	.83**	.25**	.09	.30**	.37**	1	
HSQX-B	.12	-.06	.07	.06	.08	.10	.14	.05	.01	.21**	.23**	.32**	.25**	.80**	.12	.18*	.292**	.28**	1

Note; TCQ-D = TCQ Distraction; TCQ-S = TCQ Social; TCQ-W = TCQ Worry; TCQ-P = TCQ Punishment; TCQ-R = TCQ Reappraisal; CTNES-NRD = CTNES Nonreferent Downward; CTNES-ORU = CTNES Other Referent Upward; CTNES-SRU = CTNES Self-referent Upward; CTNES-NRU = CTNES Nonreferent Upward; HS-AF – Affiliative; HSQ-SE = Self Enhancing; HSQ-AG = Aggressive; HSQ-SD: Self-Defeating; HSQ-B = Black; HSQ = Total; HS-AFX – Affiliative with X; HSQ-SEX = Self Enhancing with X; HSQ-AGX = Aggressive with X; HSQ-SDX: Self-Defeating with X; HSQ-BX = Black with X; HSQX = Total with X;

* $p < .05$; **, $p < .01$, *** $p < .001$.

Bivariate correlations were considered between each of the cognitive coping measures and the mental health outcome measures, and these are summarised in table 5.9 below.

Table 5.9: Correlational table showing relationships between cognitive constructs and mental health measures

	IES	PHQ	GAD	CAGE
TCQ-D	.29**	.29**	.30**	.26**
TCQ-S	-.11	-.13	-.18*	-.16
TCQ-W	.22**	.31**	.30**	.11
TCQ-P	.27**	.20*	.20*	.19*
TCQ-R	.34**	.31**	.30**	.27**
CTNES-NRD	.13	.07	.04	.04
CTNES-ORU	.15	.15	.16	.15
CTNES-SRU	.32**	.08	.07	.20*
CTNES-NRU	.45**	.14	.14	.29**
HSQ-AF	-.02	-.09	-.13	.02
HSQ-SE	-.01	-.18*	-.12	.01
HSQ-AG	.16*	-.10	-.12	.04
HSQ-SD	.30**	.14	.11	.14
HSQ-B	.06	.06	-.04	.14
HSQ-AFX	-.05	-.16	-.23**	.03
HSQ-SEX	-.06	-.25**	-.14	-.04
HSQ-AGX	.14	-.09	-.06	.14
HSQ-SDX	.25**	.10	.11	.18*
HSQ-BX	-.03	.08	-.03	.13

Note: IES-A =IES Avoid; IES-I = IES Intrusion; IES-H = IES Hyper Arousal; IES = IES Total; PHQ = PHQ Total; GAD = GAD Total; CAGE = CAGE Total; TCQ-D = TCQ Distraction; TCQ-S = TCQ Social; TCQ-W = TCQ Worry; TCQ-P = TCQ Punishment; TCQ-R = TCQ Reappraisal; TCQ = TCQ Total; CTNES-NRD = CTNES Nonreferent Downward; CTNES-ORU = CTNES Other Referent Upward; CTNES-SRU = CTNES Self-referent Upward; CTNES-NRU = CTNES Nonreferent Upward; CTNES = CTNES Total; HS-AF – Affiliative; HSQ-SE = Self Enhancing; HSQ-AG = Aggressive; HSQ-SD: Self-Defeating; HSQ-B = Black; HSQ = Total; HS-AFX – Affiliative with X; HSQ-SEX = Self Enhancing with X; HSQ-AGX = Aggressive with X; HSQ-SDX: Self-Defeating with X; HSQ-BX = Black with X; HSQX = Total with X; * $p < .05$; **, $p < .01$, *** $p < .001$

5.2.8 Summary

Higher levels of PTSD symptomatology are associated with greater use of all thought control strategies except social control; self-referent and nonreferent upward counterfactual thinking; aggressive humour at work and self-defeating humour both at work and with a specified person.

Higher levels of depression symptomatology are associated with greater use of all thought control strategies except social control and lower levels of symptomatology are associated with increased use of self-enhancing humour used at work and with a specified person, but no associations were found between any counterfactual thinking strategy and depression symptomatology.

Higher levels of anxiety symptomatology were associated with greater use of all thought control strategies except for social control, which was associated with lower anxiety symptomatology. Again, no counterfactual strategies were associated with anxiety symptomatology.

Higher alcohol misuse scores were associated with greater use of thought control strategies of distraction, punishment and reappraisal, with self-referent and nonreferent upward counterfactual thinking and with self-defeating humour with a specific individual.

5.2.9 Freestyle examples of humour recorded on questionnaires

Participants were asked to offer examples of humour. Some of these cannot be reported as they are potentially identifying of specific incidents or because of participants' sensitivity to the private nature of some jokes. Examples include: "lighthearted mocking of state of my work uniform after demanding rescue in hard-working weather conditions; recording people's reactions and what they said during an incident; pouring cement into a colleague's shoes that they had left out, bricking up people's lockers, putting fake scratch marks on somebody's car; wetting people (firefighters); making people jump; trying to hang someone's locker in the tower; we all take the mickey out of anything (black humour).

5.2.10 Predictors of psychological symptomatology on multiple regression

Hierarchical linear regressions were conducted to examine predictors of psychological symptomatology.

Post hoc power calculation

In attempting to limit the number of potential predictors, in addition to the TCQ, CTNES and HSQ subscales, only those variables that were significantly correlated with at least one of the outcome variables were included in the regression analyses. However, this led to the inclusion of 33 predictor variables. Given the sample size of 154, there is a risk of the study being underpowered and so a post hoc power calculation was carried out.

Of the regression analyses reported, the lowest R^2 value was .39 (predicting the PHQ using the HSQ). With a 95% CI, the observed effect size was H1 ρ^2 = .226, i.e. a large effect size. Inserting the observed effect size into a power calculation using random effects for a 2-tailed test with alpha = .05 and a power of .80, a sample size of 130 was determined to be sufficient. In other words, although the sample size might be considered too small for the number of predictor variables included, the observed effect size was large enough for the sample to be sufficient in this study.

These variables were entered in four steps:

Step 1 contained the demographic data of firefighter type and educational qualifications (recoded as dichotomous variables), previous divorce and previous psychiatric diagnosis. Although a significant correlation had been found between prescribed medication for mental health conditions and resultant mental health, too few participants had answered this question to permit its inclusion in the multiple regression analysis.

Step 2 contained occupational exposure data where such data had included presence at a road traffic collision; persons trapped in incidents other than RTCs or fires; serious injury sustained by a colleague; perceived danger to the participant, to colleagues, and to members of the public. For data related to exposure to the incident the participant remembered well, the predictors entered were death and serious injury of a colleague; and threat of serious injury to the participant.

Step 3 contained the Criterion A2 responses during occupation-related exposure of fear, helplessness and horror and the same A2 responses for non-occupation-related exposure.

Step 4 contained all the psychological predictors of thought control (distraction, social, worry, punishment and reappraisal); counterfactual thinking (Non-referent downward, other-referent upward, self-referent upward and Nonreferent upward); and humour style (affiliative, self-enhancing, aggressive, self-defeating, and black).

The Tables below give the results of the regression analyses. Table 5.10 includes the HSQ subscales (use of humour with colleagues) while in Table 5.11 these were replaced with the HSQ-X subscales (use of humour with someone close).

Multicollinearity was an issue with condition indices of 57.5 and 55.9 for the analyses including either the HSQ or the HSQX subscales respectively. Standardising all continuous variables reduced the condition indices to 6.4 and 6.3 for the regression analysis including HSQ and HSQX respectively. Results using standardised and unstandardised variables were identical for β-weights and t values, and although the B and SE of B β values changed, this had no impact on the results. Consequently, the results using unstandardised variables are presented.

All outcome variables were transformed using square root transformations. The change in R^2 values indicate the amount of additional variance accounted for with each additional step while the β-weights are those reported once all four steps have been entered.

Table 5.10: Summary of regression analysis for predictors of symptomatology including HSQ

		IES-R				PHQ				GAD				CAGE			
		ΔR^2	B	SE B	β	ΔR^2	B	SE B	β	ΔR^2	B	SE B	β	ΔR^2	B	SE B	β
Step 1		0.04				0.10**				0.11**				0.14***			
	FF Type		0.04	0.70	0.00		1.20	0.44	0.24**		1.08	.44	0.22*		.31	.23	.12
	Previous divorce		0.95	0.36	0.21*		0.19	0.23	.07		.14	.23	.05		-.31	.12	-0.21*
	Psychiatric diagnosis		-0.65	0.68	-0.08		0.22	0.43	.04		.60	.43	.12		.47	.22	0.18*
	Qualification		-0.65	0.44	-0.12		-0.05	0.28	-.02		-.12	.28	-.04		.09	.15	.05
Step 2		0.08				0.09				0.10*				0.10*			
	Road traffic collisions		0.00	0.00	-0.16		0.00	0.00	-.09		.00	.00	-.16		.00	.00	0.22*
	Persons trapped other		0.00	0.00	-0.06		0.00	0.00	.03		.00	.00	0.16*		.00	.00	-.09
	Serious Injury to colleague		-0.04	0.05	-0.07		-0.02	0.03	-.06		.03	.03	.09		.01	.02	.06
	Perceived danger to you		0.00	0.00	0.13		0.00	0.00	-.16		.00	.00	-.14		.00	.00	.04
	Perceived danger to colleague		0.00	0.00	-0.08		0.00	0.00	.25		.00	.00	-.08		.00	.00	-.10
	Perceived danger to the public		0.00	0.00	-0.01		0.00	0.00	.00		.00	.00	-.06		.00	.00	.07
	Inc. Death of a colleague		0.29	0.53	0.05		0.19	0.33	.05		.55	.33	.14		-.16	.17	-.08
	Inc. Serious injury to colleague		-0.16	0.63	-0.02		0.74	0.40	.18		.46	.40	.11		-.02	.21	-.01
	Inc. Threat of your serious injury		0.53	0.53	0.09		0.35	0.33	.10		.11	.34	.03		-.16	.18	-.08
Step 3		0.15***				0.03				0.04				0.08*			
	A2 Fear		0.83	0.36	0.19*		-0.07	0.23	-.03		.39	.23	.15		.00	.12	.00
	A2 Helplessness		0.64	0.35	0.18		0.42	0.22	.20		.36	.22	.17		.23	.12	.20
	A2 Horror		-0.25	0.36	-0.06		-0.38	0.23	-.16		-.38	.23	-.16		-.06	.12	-.05
	A2 Fear outside work		-0.39	0.37	-0.11		0.20	0.23	.09		.08	.24	.04		.26	.12	0.23*
	A2 Helplessness outside work		0.04	0.32	0.01		-0.20	0.20	-.10		-.05	.20	-.03		-.19	.11	-.18
	A2 Horror outside work		0.15	0.46	0.04		-0.08	0.29	-.03		-.08	.29	-.03		-.02	.15	-.02
Step 4		0.17**				0.17**				0.15*				0.08			
	TCQ-Distraction		0.03	0.06	0.06		0.05	0.04	.15		.04	.04	.13		.02	.02	.11
	TCQ-Social		-0.08	0.05	-0.14		-0.02	0.03	-.06		-.03	.03	-.09		-.01	.02	-.04
	TCQ-Worry		-0.06	0.08	-0.08		0.09	0.05	.19		.06	.05	.12		-.01	.03	-.03
	TCQ-Punishment		-0.15	0.13	-0.11		0.05	0.08	.07		-.02	.08	-.02		.04	.04	.10
	TCQ-Reappraisal		0.10	0.07	0.16		0.04	0.04	.11		.07	.04	.19		.02	.02	.12
	CTNES-Nonreferent downwards		-0.06	0.05	-0.10		-0.01	0.03	-.04		-.04	.03	-.11		-.03	.02	-.19
	CTNES-Other-reference upwards		-0.05	0.05	-0.09		0.02	0.03	.06		.03	.03	.09		.01	.02	.04
	CTNES- Self-referent upwards		0.09	0.08	0.11		-0.02	0.05	-.03		-.02	.05	-.04		.02	.03	.08
	CTNES-Nonreferent upwards		0.20	0.07	0.32**		-0.04	0.04	-.11		-.01	.04	-.04		.02	.02	.11
	HSQ-Affiliative		-0.01	0.03	-0.02		0.01	0.02	.06		-.01	.02	-.05		.00	.01	.04
	HSQ-Self-enhancing		-0.01	0.02	-0.03		-0.03	0.01	-.21*		-.02	.01	-.13		.00	.01	-.01
	HSQ-Aggressive		0.01	0.02	0.02		-0.01	0.01	-.09		-.02	.01	-.11		.00	.01	-.01
	HSQ-Self-defeating		0.05	0.02	0.22*		0.01	0.01	.06		.00	.01	.00		-.01	.01	-.09
	HSQ-Black		0.00	0.03	0.00		0.01	0.02	.04		.00	.02	-.02		.01	.01	.07
		0.44* **				**0.39** **				**0.40*** **				**0.40*** **			

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 5.11: Summary of regression analysis for predictors of symptomatology including HSQX

		IES-R				PHQ				GAD				CAGE			
		ΔR^2	B	SE B	β	ΔR^2	B	SE B	β	ΔR^2	B	SE B	β	ΔR^2	B	SE B	β
Step 1		0.04				0.10**				0.11**				0.14***			
	FF Type		0.02	0.70	0.00		1.12	.43	0.23*		1.04	.44	0.21*		.35	.23	.13
	Previous divorce		0.95	0.36	0.21**		.23	.22	.08		.19	.22	.07		-.28	.12	-0.19*
	Psychiatric diagnosis		-0.59	0.68	-0.07		.14	.42	.03		.51	.42	.10		.45	.23	0.17*
	Qualification		-0.58	0.44	-0.11		.00	.27	.00		-.06	.27	-.02		.10	.15	.06
Step 2		0.08				0.09				0.10*				0.10*			
	Road traffic collisions		0.00	0.00	-0.14		.00	.00	-.09		.00	.00	-.16		.00	.00	0.22*
	Persons trapped other		0.00	0.00	-0.06		.00	.00	.04		.00	.00	0.17*		.00	.00	-.10
	Serious Injury to colleague		-0.05	0.05	-0.08		-.03	.03	-.08		.02	.03	.07		.01	.02	.08
	Perceived danger to you		0.00	0.00	0.14		.00	.00	-.19		.00	.00	-.19		.00	.00	.04
	Perceived danger to colleague		0.00	0.00	-0.10		.00	.00	.22		.00	.00	-.07		.00	.00	-.10
	Perceived danger to the public		0.00	0.00	-0.01		.00	.00	.03		.00	.00	-.03		.00	.00	.06
	Inc. Death of a colleague		0.23	0.52	0.04		.21	.32	.06		.56	.32	.15		-.12	.17	-.06
	Inc. Serious injury to colleague		-0.16	0.62	-0.02		.77	.38	0.18*		.47	.39	.11		-.07	.21	-.03
	Inc. Threat of your serious injury		0.47	0.53	0.08		.27	.33	.07		-.01	.33	.00		-.16	.18	-.08
Step 3		0.15***				0.03				0.04				0.08*			
	A2 Fear		0.86	0.36	0.20*		.01	.23	.00		.43	.23	.17		.01	.12	.00
	A2 Helplessness		0.71	0.36	0.20*		.33	.22	.16		.33	.22	.15		.19	.12	.17
	A2 Horror		-0.28	0.37	-0.07		-.37	.23	-.16		-.44	.23	-.19		-.05	.12	-.04
	A2 Fear outside work		-0.42	0.38	-0.12		.25	.23	.12		.13	.23	.06		.24	.13	.21
	A2 Helplessness outside work		0.00	0.33	0.00		-.16	.20	-.08		-.07	.20	-.03		-.14	.11	-.13
	A2 Horror outside work		0.19	0.46	0.05		-.08	.28	-.03		.03	.29	.01		-.06	.15	-.05
Step 4		0.18**				0.20**				0.17**				0.08			
	TCQ-Distraction		0.04	0.06	0.07		.05	.04	.15		.04	.04	.12		.02	.02	.11
	TCQ-Social		-0.07	0.05	-0.12		-.02	.03	-.06		-.03	.03	-.08		-.01	.02	-.04
	TCQ-Worry		-0.05	0.08	-0.07		.09	.05	.19		.07	.05	.15		-.02	.03	-.08
	TCQ-Punishment		-0.13	0.13	-0.10		.06	.08	.07		-.02	.08	-.02		.04	.04	.09
	TCQ-Reappraisal		0.10	0.07	0.17		.04	.04	.10		.06	.04	.17		.03	.02	.13
	CTNES-Nonreferent downwards		-0.07	0.05	-0.13		-.01	.03	-.02		-.03	.03	-.08		-.03	.02	-.15
	CTNES-Other-reference upwards		-0.04	0.05	-0.07		.03	.03	.08		.03	.03	.07		.01	.02	.04
	CTNES- Self-referent upwards		0.08	0.08	0.10		-.03	.05	-.06		-.03	.05	-.06		.02	.03	.08
	CTNES-Nonreferent upwards		0.19	0.07	0.31**		-.03	.04	-.08		.00	.04	-.01		.02	.02	.08
	HSQ-Affiliative with X		-0.01	0.02	-0.03		.00	.01	.01		-.03	.01	-.15		.00	.01	.05
	HSQ-Self-enhancing with X		-0.03	0.02	-0.10		-.04	.01	-0.30**		-.02	.01	-.15		-.01	.01	-.08
	HSQ-Aggressive with X		0.01	0.02	0.04		-.01	.01	-.06		-.01	.01	-.05		.00	.01	.06
	HSQ-Self-defeating with X		0.05	0.02	0.22*		.01	.01	.05		.00	.01	.01		.00	.01	.02
	HSQ-Black with X		-0.02	0.03	-0.06		.01	.02	.05		-.01	.02	-.04		.00	.01	.04
		0.45* **				**0.41*** **				**0.42*** **				**0.40*** **			

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Overall, Table 5.10 shows that the model accounted for 44% of the variance in IES scores. Neither the demographic (step 1) nor exposure variables (step 2) accounted for a significant amount of variance in terms of blocks, although in terms of individual coefficients, firefighters who had been previously divorced reported higher IES scores. A2 responses accounted for a significant amount of additional variance (15%) although only fear made a unique contribution. Most importantly, over and above demographic, exposure and A2 responses, psychological variables accounted for a significant amount of additional variance (17%) in IES scores. Of these variables, the nonreferent upward counterfactual thinking and the self-defeating humour style made unique contributions (higher scores on both predicted higher IES scores). Interestingly, when HSQ scores in the workplace were replaced with HSQ scores with a close person outside of the workplace (Table 5.11), results were essentially the same, with greater nonreferent upward counterfactual thinking and self-defeating humour predicting higher IES scores. The only difference was that A2 responses of both fear and helplessness were predictive of IES scores (compared with only fear responses when using HSQ scores in the workplace).

With regard to the PHQ, Table 5.10 shows that the model accounted for 39% of variance in scores. Here, the demographic variables (step 1) did account for a significant amount of variance as a block (10%), with firefighters who operated as 'day crew' reporting significantly higher PHQ scores. Neither exposure variables (step 2) nor A2 responses (step 3) accounted for a significant amount of variance in terms of blocks nor in terms of individual coefficients. As with the IES model, over and above demographic, exposure and A2 responses, the psychological variables accounted for a significant amount of additional variance in PHQ scores (17%). In this model, self-enhancing humour made a unique contribution (higher scores predicted lower PHQ scores). As with the IES, when HSQ scores in the workplace were replaced with HSQ scores with a close person outside of the workplace (Table 5.11), results were essentially the same, with self-enhancing humour predicting low PHQ scores.

Overall, Table 5.10 shows that the model accounted for 40% of the variance in GAD scores. Both demographic (step 1) and exposure (step 2) variables significantly accounted for variance at 11% and 10% respectively. Operational factors of operating as day crew and attendance at incidents in which persons were trapped (excluding in fires or RTCs) uniquely contributed to the variance. A2 variables did not account for any additional variance in GAD scores, and neither did any psychological variable. Again, when HSQ scores in the workplace were replaced with HSQ scores with a close person outside of the workplace (Table 5.11), results were essentially the same with both operating as day crew and attending incidents in which persons were trapped predicting higher GAD scores.

Finally, Table 5.10 shows that the model accounted for 40% of the variance in CAGE scores. Demographic variables (step 1) accounted for a significant amount of variance (14%), with both a previous divorce and previous psychiatric diagnosis individually predicting lower and higher CAGE scores respectively. Exposure variables also significantly contributed to variance (10%), with the individual coefficient of attending RTCs uniquely contributing to higher CAGE scores. A2 responses significantly accounted for additional variance (8%) with A2 helplessness significantly contributing to higher CAGE scores. As with GAD scores, no psychological variable accounted for additional variance in CAGE scores. Once again, when HSQ scores in the workplace were replaced with HSQX scores with the person closest outside the workplace (Table 5.11), the results were the same in essence with the exception that, for HSQ, fear outside work contributed to the model but did not for HSQX.

5.3 Discussion of the results of Study 1

5.3.1 Aim of Study 1

This was a cross-sectional study of 154 UK firefighters in which predictors of symptomatology associated with PTSD, depression, anxiety and alcohol misuse were explored. The primary focus of the study was the investigation of relationships between this symptomatology and the psychological cognitive processes of thought control, counterfactual thinking and humour style. The secondary focus was to investigate relationships between symptomatology and demographic, exposure and DSM-IV Criterion A2 variables to determine differences and similarities between this study sample and those on which previous research has been published.

5.3.2 Major findings

Key findings emerging from this study are first set out, followed by a brief discussion of their significance with reference to each psychological condition studied. A more comprehensive discussion can be found in Chapter 8.

The prevalence of symptomatology associated with PTSD, depression, anxiety and alcohol misuse reported in UK firefighters partially replicates the results of Meyer et al, (2012), which had a similar size sample and investigated the same conditions in US firefighters. Higher levels of anxiety symptomatology may result from methodological differences. Of three psychological predictors tested in a combination previously not used in the trauma literature, nonreferent counterfactual thinking and self-defeating humour in relation to the workplace both predicted higher levels of PTSD symptomatology, whilst self-

enhancing humour, predicted lower symptomatology of depression. The demographic factors of previous divorce and previous psychiatric diagnosis predicted symptomatology of alcohol misuse whilst the operating schedule of 'day crew' firefighting predicted symptomatology of depression and anxiety. Three A1 exposure variables were predictive: attendance at a Criterion A1 CI involving persons trapped other than in fires or RTCs predicted anxiety symptomatology whilst attendance at RTCs predicted alcohol misuse. With reference to the incident remembered well, serious injury sustained by a colleague predicted depression symptomatology. With the HSQ model, occupationally experienced A2 fear predicted PTSD symptomatology and non-occupationally experienced fear predicted alcohol misuse symptomatology. In the HSQX model, in addition to occupational fear, helplessness also predicted PTSD symptomatology.

5.3.3 PTSD symptomatology discussion

Prevalence of PTSD

The prevalence rate of 5.33% for PTSD symptomatology found in this study is higher than the 3% rate found in the UK Adult Psychiatric Morbidity Study (2007) although the measure used, the Trauma Screening Questionnaire (TSQ; Brewin et al., 2002) does not include avoidance and numbing symptomatology. Because it is a screening tool, it is not required to contain all the diagnostic criteria, but only those which best predict a diagnosis, and it has been determined by NICE to be an appropriate tool for use in primary care. One of several reasons for using the TSQ was that it was the only screening tool utilising yes/no coding which is preferred when using computer-assisted self-response questionnaires.

This rate is comparable with that of 6.5% (n = 2) found in Haslam & Mallon's (2003), study, being the only published study found on UK firefighters as a distinct group directly measuring PTSD. This finding lends support to those studies reporting rates of PTSD at or below 8% in firefighters (Del Ben et al., 2006; Chen, 2007; Chiu et al., 2011; Nydegger, Nydegger & Basile, 2011; Morren et al., 2005) and replicates the findings of Meyer et al., (2012) in American firefighters.

The predictors examined accounted for 44% of the variance in symptomatology of PTSD. The major focus of the investigation was the analysis of three forms of psychological, cognitive processes: thought control, counterfactual thinking and humour style. Over and above demographic, exposure and A2 responses, these psychological variables accounted for a significant amount of additional variance (17%)

in IES scores, with nonreferent upward counterfactual thinking and self-defeating humour emerging as significant predictors of PTSD symptomatology, contributing uniquely to the variance in the final model, irrespective of whether HSQ or HSQX was entered.

Thought control and PTSD

Supporting previous studies showing associations between thought suppression and symptomatology (e.g. Amir et al., 1997; Vázquez, Hervás & Pérez-Sales, 2008; Cameron, Palm & Follette, 2010; Chatard et al., 2012; Valdez & Lilly, 2012) strong correlational relationships were found in this Study using the TCQ. Further, thought control, as measured by the TCQ, contributed to the variance in symptomology, but no one item contributed uniquely and independently to variance.

These results tend to support earlier suggestions that thought control and counterfactual thinking may be intertwined (El Leithy, Brown & Robbins (2006).

Counterfactual thinking and PTSD

The results of Study 1 support previous studies in finding positive associations between counterfactual thinking and PTSD (Valentiner et al., 1996; Gilbar, Plivasky & Gil, 2010; Bhushan & Kumar, 2012) and support such association through upward direction (Gilbar, Plivasky & Gill, 2010; Bhushan & Kumar, 2012). On correlational analysis, both self-referent upward and nonreferent upward showed strong relationships with all three subscales of the IES-R. It is suggested that self-referent counterfactuals, whereby the individual in effect casts responsibility for the outcome on himself, are associated with PTSD symptomatology, but that where an individual ascribes responsibility not to self or others, but to an external and neutral 'target', the potency of such nonreferent counterfactual thinking is greater.

Explanations for the predictive strength of nonreferent upward counterfactual thinking in comparison with any form of thought control are suggested. Firstly, such existential thinking reflects hopelessness associated with the theory of shattered assumptions (Janoff-Bulman, 1992). Secondly, continued focus on the hopelessness of the situation which cannot be changed because it is in the hands of "fate" rather than another human being or the self may become a ruminative process (Rye et al., 2008); and PTSD ruminations of a counterfactual nature maintain PTSD symptomatology (El Leithy, Brown & Robbins 2006). Thirdly, counterfactual inhibition involves thought control strategies because they are associated with frequency of generation (El Leithy, Brown & Robbins, 2006). Finally, counterfactuals may operate as negative appraisals, such that a feedback loop operates with negative affect leading to counterfactuals which increase negative affect (Roese, 1977).

Humour style and PTSD

The second psychological predictor contributing significantly and uniquely to the development of PTSD symptomatology was self-defeating humour. Relationships between this humour style and PTSD have not, it appears, been previously been investigated. Characterised as amusing others at one's own expense, laughing along with others or using it to hide real feelings, it has clear negative connotations. Perhaps, when the banter in which firefighters engage is experienced not as a bonding, joking, mechanism, but instead as an indicator of dislike or disdain, or if it engages existing negative beliefs about oneself, or cloaks unwanted negative emotions, it has a similar effect to the negative appraisals of self inherent in the cognitive model of PTSD (Ehlers & Clark, 2000). As such, it would make sense that it is predictive of a higher risk of PTSD symptomatology in Study 1.

If those negative appraisals only operated when the firefighter was at work, there should be no association between self-defeating humour and PTSD when s/he was with their loved one. As there was, it could be argued that the use of this style may be context dependent, but it is also conceivable that its use does develop over time as a result of the nature of the occupational environment. Since humour is the "language" used by firefighters, the manner in which it is used may develop through experience. Janes & Olson (2000) coined the term "jeer pressure" which arises when an individual sees someone else being subjected to ridicule, and found that it induced conformity and fear of failure whilst also making rejection more accessible. It is speculated that firefighters exposed to the "banter" of their peers may operate self-defeating humour as a pre-emptive defence mechanism to this type of humour, in other words, they get in first before they can be subjected to rejection from their peers. Such speculation could only be tested through longitudinal studies commenced prior to induction within a fire service.

Finally, it is worth noting that no positive humour style negatively predicted PTSD symptomatology. This is thought provoking, as if the results of this Study can be replicated, the inference would be that humour style of itself does not protect against the development of PTSD nor help to create resilience against the risks inherent in multiple, chronic exposure to PTEs for firefighters.

A further discussion on humour styles is at Chapter 8 which integrates all three study results.

Other predictors of PTSD

No Criterion A1 variable predicted PTSD on regression, supporting Beaton et al., (1999); Corneil et al., (1995); Declercq et al., (2011) and Meyer et al., (2012) in finding no associations with multiple exposure to a variety of critical incidents. However, the Criterion A2 subjective variables of intense fear and helplessness did explain variance. Intriguingly, although only fear predicted PTSD when the HSQ was entered into the model, both fear and helplessness did so with HSQX entered.

The power of the A2 response to predict PTSD is not settled, but this Study supports Declercq et al., (2011) in finding that intense fear and helplessness contributed to PTSD, but not in finding the same effect for horror. To some degree, the point is now moot, as DSM-5 (APA, 2013) does not require the A2 response as part of the Criteria which transform a potentially traumatic A1 event into a traumatic event, although emotional responses are retained as Criterion D (negative alterations in cognitions and mood associated with traumatic events) but only as a 'persistent negative emotional state', and the examples given do not include helplessness.

Leaving aside the DSM criteria, helplessness does, however, seem to be an important marker for suffering (Fullerton et al., 1992; Alexander & Klein, 2001; Hill & Brunsden, 2009) and, when symptomatology did reach the required level of distress, it was the intensity of the three A2 responses that were more predictive than the event itself (Declercq et al., 2011).

5.3.4 Depression, anxiety and alcohol misuse discussion

Prevalence rates

The prevalence rate for depression in study 1, at 3.29% was calculated following Kung et al., (2013) by combining prevalence of severe depression at 1.32% with moderately severe at 1.97% to provide a meaningful comparison between this study on UK firefighters, using the PHQ-9, and that of Meyer et al., (2012) who found a rate of 3.5% for moderate to severe depression using the BDI-II. This results in similar rates between the two study groups of firefighters. Comparison with the UK Adult Psychiatric Morbidity Study (2007) is difficult as mixed anxiety and depressive disorders were measured together and prevalent at a rate of 9.%.

For GAD, direct comparison between the rate of 8.6% (moderate to severe) found in Study 1 using the GAD-7 and that of 4.2% (Meyer et al., 2012) and 7.4% (Monteiro et al., 2013) both using the BAI is somewhat problematic as the BAI measures anxiety, not GAD directly. In the UK, GAD prevalence was reported at 4.4%, the most common CMD after mixed anxiety and depression. GAD prevalence ranges

from 2.8% to 5% in general medical practice and in the general population from 1.6 to 5% (Spitzer et al., 2006). Lifetime prevalence ranged from 5.7%, with the highest at 7.7% in the 45-59 year age range (Kessler et al., 2005) and stood at 11% in persons over 65 (with a mean diagnosis of first onset of 35, and 24.6% after the age of 50 (Zhang et al., 2015). The use of different measures reflecting different types of prevalence rate and different criteria may influence the reported ranges.

Rates of probable alcohol misuse (CAGE ≥ 2) were reported by 17.7% of participants in this study, while rates of possible misuse (CAGE ≥ 1) were found in 24.8% of the sample. These rates are similar to those found in the UK general population of 24.2% for hazardous drinking. Meyer et al., (2012) found a probable alcohol misuse rate within the past year in US firefighters of 10.6% and possible misuse at 22.5%, while lifetime probable misuse was observed in 25.4% of participants and lifetime possible abuse in 40.1%.

Predictors of symptomatology

The final model accounted for 39% of variance in PHQ scores; 40% of variance in GAD scores; and 40% in variance of CAGE scores. No thought control or counterfactual thinking coefficient predicted depression, anxiety or alcohol misuse independently indicating that neither cognitive strategy is sufficiently strong enough to affect the development of higher or lower symptomatology alone.

Self-enhancing humour uniquely predicted lower levels of depression. Since high levels of this humour style combined with high levels of rumination are associated with lower levels of dysphoria (Olson et al., 2005), these findings suggest the intriguing possibility that self-enhancing humour may buffer the association between rumination and dysphoria. This suggestion gains some support from findings that it is most closely related to humour as a coping mechanism (Martin et al., 2003), and forms a buffer between stress and sustained life satisfaction (Cheung & Yue, 2012). Interestingly, the negative association with depression was stronger when self-enhancing humour was used with the person closest to the participant than when used at work. There is no obvious explanation for this, but perhaps this indicates an even greater benefit of such a style in a one-to-one relationship than it does when used with a variety of colleagues.

Against expectation, the results did not support studies finding that greater use of affiliative humour is associated with good mental health (Chen & Martin, 2007) and greater wellbeing (Janovic, 2011), having been previously associated with lower depression and anxiety (e.g. Martin et al., 2003; (Chen & Martin,

2007; Frewen et al., 2008; Cheung & Yue, 2012). As this style consists of the tendency to tell jokes and make each other laugh, it would seem to be precisely the sort of style which would be predictive of less anxiety and depression because of the importance of the work-place bond and camaraderie of firefighters. It was negatively correlated with anxiety symptomatology when used with the person closest to the participant, however, again an unexpected result, but one which justifies the design of this study in exploring associations between humour used at, and outside, work.

Of the demographic data, firefighter type of "day crew" was an equally significant predictor of anxiety with both usages of humour entered into the regression model, and remained significant as a predictor for depression. A possible explanation for the apparent greater vulnerability of "day crew" to depression and anxiety may lie in the lifestyle this creates, since they remain in close physical proximity to their work at all times. Being exposed to visual and aural reminders of call-outs may result in not being able to distance oneself psychologically from the place of work and thereby cause emotional distress.

The findings that previous psychiatric diagnosis and previous divorce were predictive of alcohol misuse supports Kessler et al., (1995) in reporting that that alcohol misuse was often associated with other disorders. The finding regarding previous divorce as a predictor of lower alcohol misuse begs more questions than it answers. Virtually all studies have found a relationship between drinking alcohol and marital status but have not consistently agreed on the direction of this relationship, according to Osterman, Sloan & Taylor (2005). They found that discrepancies between consumption in a married couple were more significant than the amount consumed, such that the lowest rates of divorce were found in couples where both were teetotal or heavy drinkers and the greatest likelihood of divorce arose when only one was a heavy drinker. No relationship, however, was found between divorce and problem drinking (defined as scores ≥ 2 on CAGE) in their study. To the extent that alcohol misuse may be a response to stressful situations, it is possible that those had divorced, and were therefore not in a relationship they no longer desired, had less need to use alcohol in this way.

Two types of event independently predicted symptomatology. First, attendance at incidents where persons were trapped in situations other than fires or road traffic collisions predicted anxiety, perhaps because of the relative rarity of such events meaning that there is less training and less practice for handling them. Secondly, attendance at road traffic collisions (RTCs) predicted alcohol misuse. Approximately ten times more fatalities occur in RTCs than in fires, and a correspondingly higher number of injuries sustained. In fires, people are frequently killed by the effects of smoke inhalation

and do not necessarily show signs of any physical trauma, whereas in RTCs, firefighters are dealing with live casualties in great distress, sometimes trapped, and may die in view of numerous crew members who are surrounding the vehicle. The bodies of those who die in RTCs tend to be more physically damaged (personal communication with Fire Officer: 9.10.13). Perhaps the chosen coping mechanism for some firefighters with high exposure to RTCs is self-medication.

The finding that serious injury sustained by a colleague in the incident they remembered well predicted depression symptomatology is unsurprising given the strength of the bond between firefighters, such that serious injury sustained by a firefighter is akin to that sustained by a family member.

For non-occupational exposure, feeling fear was significantly associated with alcohol misuse on correlational analysis and predicted it on multiple regression but only when the HSQ was entered. The reasons why fear should be more associated with alcohol misuse when experienced outside of work than during it can only be speculated. Perhaps the support of colleagues in dealing with CIs, the training and the familiarity of occupational exposure help the firefighters to cope with fear experienced, whereas without these, they resort to drinking. Alternatively, the result may simply not be robust but a chance finding.

5.3.5 Strengths and limitations

In common with the majority of trauma-related research, this study was cross-sectional in design, which limits inferences as to the direction of relationships (Meyer et al., 2012). Longitudinal firefighter studies cited by Cook & Mitchell (2013) include Heinrichs et al., (2005) and Bryant & Guthrie, (2005; 2007); Bryant et al., 2007) but the majority have been cross-sectional. Thus, in study 1 the outcome variables were assessed at one point in time without the benefit of prospective data, thereby not permitting a comparison between prevalence rates pre-and post-employment as a firefighter. However, Study 1 assessed four outcome variables (PTSD, depression, anxiety and alcohol misuse) which extends the literature on UK firefighters and broadly supports a study on the same conditions using a similar design in US firefighters (Meyer et al., 2012).

Some samples of firefighters are selected on the basis of their exposure to a specific event (Del Ben et al., 2006), but study 1 included firefighters' total cumulative exposure and their responses to a single event, termed "the incident you remember well". This provided the opportunity to compare results with both multiple exposure to a wide variety of common CIs, and as against an incident likely to be remembered because of its individually perceived 'psychonoxious' characteristics (Alexander & Klein,

2001). This responded to the point made by Declercq et al., (2011) and cited by Meyer et al., (2012) that the characteristics of the PTE may be more important than the number of them in predicting distress. It also responds to the point made by DiGangi et al., (2013) that, where study participants are not asked to think of a specific event, it is possible that they are responding to a range of events in the context of their symptomatology.

As with much retrospective data collection in which using recall to measure cumulative exposure is common (Weiss et al., 2010), firefighters in this Study were asked to recall PTEs, which invites the criticism that memory is liable to be less than perfect, but is unfortunately unavoidable in a cross-sectional, retrospective study. At worst, the exposure data shows the range of events to which firefighters have responded. Further, although the study sample was not drawn from the nation as a whole, it benefited from the inclusion of firefighters with a wide range of years of experience, levels of seniority and exposure variables from a variety of geographical locations, enhancing the representative nature of the sample. The population available totalled 163 individuals (approximately replicating the proportions of each type of service – wholetime, day crew and retained).

Study 1 did not include analysis of any relationship between age and symptomatology, the nature of which is a matter of ongoing debate in the firefighter literature, because of the intertwining of age, length of service and rank. Meyer et al., (2012) found such a high correlation between age and years of service, that the latter was used instead "to reduce the number of predictors and potential multicollinearity" (p. 8). Given that age is "presumably a proxy for an increased number of traumatic events" (Del Ben et al., 2006, p.46), and for the practical purpose of reducing the number of potential predictors, years of service alone was retained.

The DSM-IV Criterion A2 responses have been removed from the exposure criterion of DSM-5, and could arguably be now regarded as of little diagnostic relevance. However, the decision to include these in Study 1 responded to the comment that "in virtually all trauma research using self-report measures, an evaluation of DSM-IV Criteria A1 (exposure to a traumatic event) and A2 (fear, helplessness, or horror) is absent from the criteria for determining caseness" (Del Ben et al., 2006, p.44). As with their study, Study 1 supports the importance of assessing A2 in the firefighter population.

Study 1 did not include a measure of social desirability, which Meyer et al., (2012) did utilise with their sample of US firefighters because of concerns as to whether participants would be willing to report psychological symptoms on an in-person assessment (p. 5). Wagner, Heinrichs & Ehlert (1998) had previously found a high level of social desirability (22.9%) in firefighters, and this was a concern shared for Study 1. However, Wagner & O'Neill (2012) reported that many participants in their study reported difficulties in this area, and concerns about social desirability having an impact on the results was minimal. Further, in study 1, the investigator was present with the participants during the entire data collection. Of the available sample, 94.5% returned usable data, which certainly seems to suggest that it is effective in data collection, supporting collection of surveys during station visits (Dean, Gow & Shakespeare French, 2003). It is possible that the presence of the investigator inhibited participants from responding honestly, particularly with the mental health measures. However, given that they chose their own anonymity number from a random batch and that they knew their consent forms would be separated from their responses, they were aware that individual identification was unlikely to occur, which offers some safeguard.

5.3.6 Conclusion

Resilience to the development of psychopathological conditions in this sample of UK firefighters was high, with the prevalence of all four conditions studied broadly similar to findings in firefighters from the USA (Meyer et al., 2012) using comparable measures (except for GAD) and study size and accounting for methodological differences. For example, the prevalence rate of depression at 3.29% was calculated following Kung et al., (2013) by combining severe and moderately severe depression results which achieves a meaningful comparison between the PHQ-9 used in this study and the BDI-II used in that of Meyer et al., (2012). This could not be achieved with GAD because the GAD-7 measures a specific anxiety disorder, whilst the BAI measures physiological and cognitive symptoms of anxiety. Further, differences in PTSD symptomatology may be associated with geographical location or culture of participants, with diverse ranges in prevalence reported internationally, as discussed in Chapter 2. These methodological differences did not result in substantially different PTSD prevalence rates in the study sample of UK firefighters' to those of the US firefighters reported by Meyer et al., (2012) study. However, there are significant predictors of distress, notably nonreferent counterfactual thinking and self-defeating humour positively predicting PTSD symptoms and self-enhancing humour predicting lower symptoms of depression. These findings extend the literature on PTSD symptomatology and other forms

of suffering and are suggestive of a strong impact on negative styles of cognition. Further extending the literature, this study has shown that RTCs; incidents in which persons are trapped other than in fires; and incidents resulting in serious injury to colleagues are potentially psychonoxious. The findings that the A2 responses of fear and helplessness experienced during a CI create a vulnerability to both PTSD and alcohol misuse, fail to support the removal of this Criterion from DSM-5, but support other studies in the first responder literature finding similar associations (e.g. Del Ben et al., 2006; Declercq et al., 2011; Bryant & Harvey, 1996). Having been previously diagnosed with a psychiatric disorder creates a vulnerability to alcohol misuse, whereas a previous divorce negatively predicts it and these findings indicate the potential significance of pre-trauma life events on subsequent suffering, unrelated to the occupation of firefighter.

In conclusion, this study utilised a cross-sectional approach to measuring associations between PTSD (and its comorbid disorders) across a range of PTEs, contributing to the literature on first responders, and on UK firefighters specifically. It responds to a recommendation that researchers should investigate a "comprehensive menu of prototypical major negative events in order to find out which reliably precede the onset of PTSD B-F symptoms and which do not (Friedman, 2011, p.7) and has identified pre-PTE, peri-PTE, and post-PTE predictors of symptomatology of suffering in four domains.

Chapter 6 : Results of longitudinal investigation

6.0 Introduction

During the course of the data collection for study 1, a group of firefighters was exposed to an incident involving unusual characteristics, which is described as the Critical Incident ("CI"). The victim had become trapped in circumstances which produced unusual occupational demands. Firefighter crews responded to the CI in a rescue attempt, but unfortunately, the life of the victim could not be saved.

Full details of the CI cannot be given since disclosure would put at risk the identity of those involved, including the victim, family members and responding crews. This does not diminish understanding of the results, nor its representative capacity, because the limited description of its features suffices to show that it was a DSM-IV Criterion A1 event, involving death and body retrieval.

In the cross-sectional study 1, participants responded to questions regarding a variety of incidents they had attended during the course of their careers. Study 2 builds on this by examining responses to one incident with varying degrees of exposure for the participants. It is longitudinal in design, providing an opportunity to examine differences in emotional responses over time.

Further, as with study 1, this study investigates the prevalence of symptomatology of PTSD, depression, GAD and alcohol misuse, providing a comparison between overall career and single incident exposure. Although not investigated, as was the case with study 2, through the medium of specific instruments to measure thought control, counterfactual thinking and use of humour, short questions were administered to assess whether, and how, these cognitive processes might have been used in the CI.

6. 1 Methods

The data were collected at T1 (n = 23) approximately 6 months after the critical incident, and T2 (n = 14) approximately 15 months afterwards.

6.1.1 Measures

The same mental health measures as had been previously conducted were used: (IES-R, PHQ-9, GAD 7 and CAGE measuring symptomatology of PTSD, depression, Generalised Anxiety Disorder and alcohol misuse respectively) with the firefighters across:

Demographic data: firefighter type, gender, age, length of service and rank

Previous mental health assistance: diagnosed psychiatric disorder, counselling/other mental health assistance and counselling/other mental health assistance in connection with this incident

Incident involvement: initial attendance and/or body recovery, and learning about the incident

Responses to the incident: fear, helplessness, horror and any other emotional response

Potential predictors of PTSD: attempts at thought suppression, "if only" thoughts" and the use of humour. The TCQ, CTNES and HSW were not used in this study for the reasons described in Chapter 4, namely that some of the firefighters would have answered these before and questionnaire fatigue was of concern, and because of time constraints including the need to interview the participants for the qualitative study immediately after administering the questionnaires.

Effect on respondent of participating: whether answering the questionnaire had caused the respondents emotional distress or been helpful in any way.

What helped to cope: whether participants found anything particularly helpful in dealing with this incident.

Results are shown firstly for T1 and then for T2.

6.2 Results at T1

6.2.1 Demographic data

The first set of analyses considered how mental scores differed across a range of demographic data: firefighter type, gender, marital status, previous divorce, children, qualifications, length of service, rank, location of fire station, ethnic origin and previous military service.

The difference in mental health scores for post-traumatic stress disorder (IES-R) depression (PHQ-9), anxiety (GAD 7) and alcohol dependency (CAGE) were considered according to demographic details. Table 6.1 summarises these data below.

Table 6.1: Summary of descriptive statistics for demographic data

Variable		N	IES		PHQ		GAD		CAGE
Firefighter type	Whole time	16	11.31 (11.82)	15	1.67 (1.99)	16	1.94 (2.72)	16	0.25 (0.58)
	Day crew	3	7.33 (7.02)	3	2.67 (4.62)	3	3.00 (5.20)	3	0.00 (0.00)
	Whole time & retained	4	0.00 (0.00)	4	0.00 (0.00)	4	0.00 (0.00)	4	0.00 (0.00)
Age	17-25	2	*7.00 (9.90)*	*2*	*0.50 (0.71)*	*2*	*0.00 (0.00)*	*2*	*0.00(0.00)*
	26-30	5	*1.80 (3.49)*	*4*	*2.75 (3.77)*	*5*	*3.20(4.44)*	*5*	*0.20 (0.45)*
	31-40	8	*9.13 (13.54)*	*8*	*0.88 (1.25)*	*8*	*1.13 (2.10)*	*8*	*0.35 (0.71)*
	41-50	8	*13.38 (10.45)*	*8*	*1.75 (2.55)*	*8*	*1.88 (2.75)*	*8*	*0.13 (0.35)*
Length of service	0-5 years	3	*0.00 (0.00)*	*3*	*0.00 (0.00)*	*3*	*0.00 (0.00)*	*3*	*0.00 (0.00)*
	6-10 years	8	*10.00 (13.48)*	*8*	*1.75 (2.76)*	*8*	*1.13 (3.18)*	*8*	*0.13 (0.35)*
	11-17 years	4	*3.80 (4.99)*	*3*	*3.00 (3.61)*	*4*	*3.75 (2.87)*	*4*	*0.00 (0.00)*
	17+ years	8	*13.50 (10.31)*	*8*	*1.25 (1.58)*	*8*	*2.00 (2.88)*	*8*	*0.38 (0.74)*
Rank	Firefighter	18	*5.17 (6.56)*	*17*	*1.59 (2.48)*	*18*	*1.61 (2.87)*	*18*	*0.22 (0.55)*
	Supervisor	5	*22.00 (13.91)*	*5*	*1.20 (1.79)*	*5*	*2.20 (3.20)*	*5*	*0.00 (0.00)*
Psychiatric Diagnosis	Yes	2	*9.00 (12.73)*	*2*	*0.50 (0.71)*	*2*	*0.00 (0.00)*	*2*	*0.00 (0.00)*
	No	21	*8.81 (11.07)*	*20*	*1.60 (2.39)*	*21*	*1.90 (2.96)*	*21*	*0.19 (0.51)*
Counselling	Yes	8	*11.50(11.06)*	*7*	*1.14 (1.46)*	*8*	*2.25 (3.24)*	*8*	*0.13 (0.35)*
	No	15	*7.40 (10.92)*	*15*	*1.67 (2.64)*	*15*	*1.47 (2.75)*	*15*	*0.20 (0.56)*
Counselling assistance	Yes	1	*10.00*	*1*	*0.00*	*1*	*0.00*	*1*	*1.00*
	No	22	*8.77 (11.15)*	*21*	*1.57 (2.34)*	*22*	*1.82 (2.92)*	*22*	*0.14 (0.47)*

A series of ANOVAs and t-tests were conducted on the above data to examine differences between the mental health measures (IES-R, PHQ, GAD and CAGE) across each demographic category. Square-root transformations were applied to decrease the skew of the data.

A one-way ANOVA confirmed that IES scores differed between firefighter type; $F(2,22) = 3.83$, $p = .039$, with a post-hoc Bonferonni test confirming significance between the 'whole time' and 'whole time retained' groups ($p = .036$). No significant differences between the mental health measures and length of service were found. With regard to rank, supervisors were found to score significantly higher than firefighters on IES scores; $t(21) = -3.53$, $p = .002$.

Curiously, firefighters with a previous psychiatric diagnosis had lower GAD scores than those who did not; $t(20.00) = 3.105$, $p = .006$). It is possible that any previous diagnosis was unconnected to anxiety, but more plausible that this is an anomaly in the results. A test for counselling assistance could not be completed due to only one participant having received counselling (compared to 22 that had not). No other significant effects were found.

6.2.2 Incident exposure

The firefighters were asked whether their involvement had been in the initial attendance at the incident, in the body recovery, in neither or in both. If they had been involved in neither, they were asked how they learned about the incident. The data are summarised in Table 6.2.

Table 6.2: Relationships between type of exposure and mental health measures

		n	IES	n	PHQ	n	GAD	n	CAGE
Initial Attendance	Yes	7	11.43 (11.40)	7	3.14 (1.95)	7	2.86 (2.85)	7	.43 (.79)
	No	16	7.69 (10.95)	15	.73 (2.09)	16	1.25 (2.84)	16	.06 (.25)
Body recovery	Yes	8	17.50 (13.24)	8	1.00 (1.51)	8	1.38 (2.67)	8	.13 (.35)
	No	13	3.77 (5.53)	12	1.75 (2.86)	13	2.23 (3.19)	13	.15 (.55)

A significant difference was found in PHQ scores such that those that had initially attended the incident had significantly higher scores those that had not; $t(20) = 4.03$, $p = .001$. Similarly, those involved in body recovery had significantly higher IES scores than those that were not; $t(19) = 3.31$, $p = .004$. No other significant differences were found.

6.2.3 A2 Responses of fear, helplessness and horror

The fire-fighters were asked whether their response to the incident involved intense fear, helplessness or horror (the A2 criterion). Not all participants committed to an answer to this question and there were missing values for the fear (*n* = 7), helplessness (*n* = 2) and horror (*n* =7) questions respectively. The data are summarised in Table 6.3.

Table 6.3: Relationships between A2 responses and mental health measures

		n	IES	n	PHQ	n	GAD	n	CAGE
Fear	Yes	1	34.00 (0.00)	1	4.00 (0.00)	1	7.00 (0.00)	1	.00 (.00)
	No	15	6.87 (10.76)	15	1.07 (1.98)	15	.60 (1.59)	15	.27 (.59)
Helplessness	Yes	7	13.14 (11.22)	6	4.00 (2.90)	7	5.00 (2.94)	7	.00 (.00)
	No	14	7.14 (11.11)	14	.64 (1.15)	14	.36 (1.34)	14	.29 (.61)
Horror	Yes	4	21.25 (18.89)	4	1.50 (1.91)	4	2.75 (3.40)	4	.00 (.00)
	No	12	4.08 (5.5)	12	1.17 (2.17)	12	.75 (1.76)	12	.33 (.65)

A comparison between those that had experienced fear and those that had not could not be completed due to only one person reporting fear. Those who reported helplessness had significantly higher PHQ scores; $t(18) = 4.19$, $p = .001$, and GAD scores; $t(19) = 5.45$, $p < .001$,than those who did not. Those who experienced horror had significantly higher IES scores than those who did not; $t(14) = 2.25$, $p = .041$.

6.2.4 Non-A2 responses

The fire-fighters were also asked whether they had any other emotional response to the incident. A total of 17 participants provided an answer (with *n* = 6 recording no response). The firefighters were invited to state freely whether they had experienced any other emotion(s), and their responses included: sympathy, curiosity, astonishment, upset for individual, a bit shocked, sorry for my fellow crewmates, gutted not to have been with the crew, apprehension, frustration, sadness, determination, focus, thoughts about the casualty, and why did he [deleted as identifying]. The existence of any other emotion was entered into SPSS as a yes/no response. However, since all three participants that reported experiencing other emotions scored 0 on IES, PHQ, GAD or CAGE scores, no further comparisons on these data were performed.

6.2.5 Symptomatology

Scores on the IES-R indicating symptomatology of PTSD; PHQ-9 for depression; GAD-7 for generalised anxiety disorder; and CAGE for alcohol misuse were administered to the participants. Cut off points are scores on the IES- R ≥ 33 representing the cut-off point for a probable diagnosis of PTSD. Scores on the

PHQ-9 of ≥ 20 represent severe; 15-19 moderately severe; 10-14 moderate; 5-9 mild; and 1-4 for no depression. For GAD-7, the cut off points are 15 for severe; 10 for moderate and 5 for mild. Scores on CAGE ≥ 2 indicate probable alcohol misuse and ≥ 1 possible. The majority of the sample reported no symptomatology and those that did that were on the lower level of intensity, which was surprising given the objective severity of the incident. These results are shown in Table 6.4 below.

Table 6.4: Prevalence rates of symptomatology in the sample

PTSD (IES)		Depression (PHQ)		Anxiety (GAD)		Alcohol (CAGE)	
Yes	9% (2/23)	Severe	0% (0/23)	Severe	0% (0/23)	Probable	4% (1/23)
No	91% (19/23)	Mild	13% (3/23)	Mild	17% (4/23)	Possible	9% (2/23)
-	-	None	87% (20/23)	None	83% (19/23)	None	83% (20/23)

6.2.6 Potential predictor of psychopathology: Thought suppression

The fire-fighters were asked: *"Have you tried to suppress thoughts of the incident when they came into your mind?"* They indicated their answers by circling a number representing' never', 'sometimes', 'often', or 'almost always', and their mental health scores were separated according to these responses. Only one participant responded to the 'often' category, so his data were combined with the 'sometimes' category. The data are summarised in Table 6.5 below.

Table 6.5: Relationships between thought suppression and mental health measures

	n	**IES**	**n**	**PHQ**	**n**	**GAD**	**n**	**CAGE**
Never	14	4.07 (5.30)	14	1.64 (2.73)	14	1.29 (2.76)	14	0.29 (0.61)
Sometimes	7	13.57 (13.38)	6	0.67 (.82)	7	1.57 (2.82)	7	0.00 (0.00)
Almost always	2	25.50 (12.02)	2	3.00 (1.41)	2	5.50 (2.12)	2	0.00 (0.00)

A one-way ANOVA revealed significant differences in IES scores; F (2,22) = 5.337, p = .014, and post hoc Bonferonni tests revealed this those who answered 'Almost always' had significantly higher IES scores than those who answered 'Never' (p = .034). No other differences were significant.

6.2.7 Potential predictor of psychopathology: Counterfactual thinking

The fire-fighters were also asked: *"Have you found yourself thinking 'If only' or similar thoughts, which you would describe as regretful thoughts, in connection with this incident?"* As before, they indicated

their answers by circling a number representing 'Never',' Sometimes', 'Often', or 'Almost Always', and, again, one instance of 'Often' was collapsed in within the 'Sometimes' category. These results are summarised in the table 6.6 below.

Table 6.6: Relationships between counterfactual thinking and mental health measures

	n	IES	n	PHQ	n	GAD	n	CAGE
Never	13	4.85 (6.59)	12	1.33 (2.35)	13	1.54 (3.10)	13	0.08 (0.28)
Sometimes	7	7.43 (6.32)	7	1.71 (2.63)	7	1.86 (2.34)	7	0.43 (0.79)
Almost always	3	29.33 (13.61)	3	1.67 (2.08)	3	2.33 (4.04)	3	0.00 (0.00)

Firefighters who reported thinking counterfactually scored higher on the IES than those who did not; F (2, 22) = 7.05, p = .005. Post-hoc Bonferonni tests revealed this significance lay between the 'Almost Always' and 'Never' respondents (p = .004), and a tantalizingly close effect was found between 'Sometimes' and 'Almost Always' (p = .051).

6.2.8 Potential predictor of psychopathology: Humour

Finally, the fire-fighters were asked: *"Have you used humour in relation to this incident?"* They indicated their answers by circling a number representing 'Never', 'Sometimes', 'Often', 'Almost Always'. Overall, 19 out of the 23 respondents used humour in relation to this incident at least some of the time. A one-way ANOVA was used to assess whether frequency of humour used in relation to this incident was related to scores on the mental health measures and this data is summarised in Table 6.7 below.

Table 6.7*:* Relationships between humour and mental health measures

	n	IES	n	PHQ	n	GAD	N	CAGE
Never	4	11.25 (16.03)	4	1.50 (1.91)	4	2.75 (3.40)	4	0.00 (0.00)
Sometimes	7	5.14 (7.58)	6	1.33 (2.80)	7	1.57 (2.82)	7	0.00 (0.00)
Often	7	6.14 (5.55)	7	1.00 (1.41)	7	0.71 (1.89)	7	0.57 (0.79)
Almost always	5	15.80 (15.01)	5	2.40 (3.29)	5	2.60 (3.97)	5	0.00 (0.00)

No significant effects were found. This may be due to the small sample size, although it is interesting to note that that both lower and higher levels of humour used were related to higher scores on the IES, PHQ and GAD. Further research may be indicated with a larger sample.

6.2.9 Helping to cope

Participants gave free responses indicating that they found the following particularly helpful in coping with this incident. So far as is possible, their words are repeated verbatim here. Comments regarding what was found helpful include the incident debrief, discussion with other watch members/fellow firefighters, talking with the station commander, training/working with the crew, the professional way they dealt with the incident, feeling proud that he and his colleagues had done their best, humour, and talking to friends and family. One participant found the incident no different to any other, stating "We turned up, did our job and went home"; one stated in response "Not really, discussing it maybe. After a while, people discussing it became boring and I thought we should put it behind us". One participant wrote in this section "I regret not saving his life".

6.2.10 Summary of results for data at T1

Demographic data revealed that whole time firefighters and those with a higher rank reported greater symptomatology of PTSD and those with a previous psychiatric diagnosis reported lower symptomatology of anxiety. Those involved in body handling had higher symptomatology of PTSD whilst those who attended initially had higher depression symptomatology. Those who responded with A2 horror revealed higher PTSD symptomatology, whilst those who responded with A2 helplessness showed higher symptomatology of both anxiety and depression. Those who engaged in thought suppression and experienced "if only" thoughts exhibited higher PTSD symptomatology.

6.3 Results at T2

A follow-up study was conducted using the same questionnaire as at T1 with fewer participants (*n = 14)*. It was not possible to make comparisons of differences between T1 and T2 in terms of individuals responding because they could not be identified from the (anonymous) questionnaire. The purpose of the second stage of Study 2 was to examine whether prevalence of symptomatology and coping responses used differed over the passage of time for the sample as a whole. This provided the opportunity to ascertain whether factors associated with pathology in the short term were also so associated in the longer term.

6.3.1 Demographic data

Table 6.8: Summary of descriptive statistics for demographic data

Variable		N	IES		PHQ		GAD		CAGE
Firefighter type	Whole time	10	10.60 (15.97)	10	3.50 (4.35)	9	4.89 (7.25)	10	0.60 (1.07)
	Whole time & retained	2	1.00 (1.41)	2	0.50 (0.71)	2	1.00 (1.41)	2	0.00 (0.00)
	Day crew	2	26.00 (32.53)	2	6.50 (9.19)	2	7.00 (9.90)	2	0.00 (0.00)
Age	Under 30	3	20.67 (25.38)	3	7.00 (5.20)	2	8.50 (7.78)	3	0.33 (0.58)
	31-40	4	6.00 (8.16)	4	0.75 (0.50)	4	1.75 (1.26)	4	0.00 (0.00)
	41-50	4	15.25 (25.20)	4	6.25 (5.85)	4	9.00 (9.83)	4	0.75 (1.50)
	50+	3	4.33 (3.79)	3	0.00 (0.00)	3	0.00 (0.00)	3	0.67 (1.15)
Length of service	6-10 years	3	26.67 (19.50)	3	5.67 (6.66)	3	5.67 (7.37)	3	0.33 (0.58)
	11-17 years	4	1.75 (1.71)	4	2.25 (1.50)	3	1.67 (0.58)	4	0.00 (0.00)
	18+ years	7	10.43 (18.96)	7	3.29 (3.41)	7	5.43 (8.32)	7	0.71 (1.25)
Rank	Firefighter	8	10.00 (16.25)	8	4.25 (4.59)	7	5.29 (7.11)	8	0.75 (1.16)
	Supervisor	6	13.33 (20.59)	6	2.50 (5.17)	6	3.83 (7.05)	6	0.00 (0.00)
Psychiatric Diagnosis	Yes	1	3.00 (0.00)	1	0.00 (0.00)	1	0.00 (0.00)	1	0.00 (0.00)
	No	13	*12.08 (18.09)*	*13*	*3.77 (4.82)*	*12*	*5.00 (6.98)*	*13*	*0.46 (0.97)*
Counselling	Yes	5	*13.80 (22.55)*	*5*	*4.40 (5.13)*	*4*	*6.00 (8.12)*	*5*	*0.20(0.45)*
	No	8	*5.25 (5.68)*	*8*	*1.75 (3.11)*	*8*	*2.75 (5.82)*	*8*	*0.63 (1.19)*

A series of ANOVAs and t-tests were conducted on the above data to examine differences between the mental health measures (IES, PHQ, GAD and CAGE) across each demographic category. Square-root transformations were again applied to the data to decrease the skew of the data.

A one-way ANOVA revealed a significant difference in PHQ scores for age; $F(3,13) = 4.387$, $p = .032$. No other comparisons were found to be significant.

6.3.2 Incident exposure

The fire-fighters again were asked whether their involvement had been in the initial attendance at the incident, in the body recovery, in neither or in both. If they had been involved in neither, they were asked how they learned about the incident. The symptomatology scores were again split by response and are summarised in table 6.9 below.

Table 6.9*:* Relationships between type of exposure and mental health measures

		n	IES	n	PHQ	n	GAD	n	CAGE
Initial Attendance	Yes	6	12.17 (20.55)	6	5.17 (4.83)	6	7.33 (7.92)	6	0.67 (1.21)
	No	8	10.88 (16.43)	8	2.25 (4.56)	7	2.29 (5.22)	8	0.25 (0.71)
Body recovery	Yes	7	13.00 (18.53)	7	2.00 (4.86)	7	2.86 (6.72)	7	0.29 (0.76)
	No	7	9.86 (17.85)	7	5.00 (4.43)	6	6.67 (6.95)	7	0.57 (1.13)

There were no significant effects found for initial attendance. However, those not involved in body recovery reported significantly higher symptoms of depression than those who had been; $t(12) = -2.211$, $p = .047$.

6.3.3 A2 Responses of fear, helplessness and horror and any other emotional response

The fire-fighters were asked whether their response to the incident involved intense fear, helplessness or horror (the A2 criterion). However, no participants reported experiencing intense fear, thus these data points were not considered. The data for reporting experiencing helplessness and horror together with other emotional responses are summarised in Table 6.10.

Table 6.10*:* Relationships between A2 responses and mental health measures

		n	IES	n	PHQ	n	GAD	n	CAGE
Helplessness	Yes	5	14.40 (22.14)	5	4.00 (5.20)	5	5.60 (6.95)	5	0.20 (0.45)
	No	9	9.78(15.71)	9	3.22 (4.76)	8	4.00 (7.15)	9	0.56 (1.13)
Horror	Yes	6	14.17 (20.07)	6	2.83 (5.12)	6	3.67 (7.12)	6	0.33 (0.81)
	No	8	9.38 (16.54)	8	4.00 (4.72)	7	5.43 (7.02)	8	0.50 (1.07)
Other Emotion	Yes	6	12.17 (20.62)	6	4.00 (4.77)	5	4.40 (7.70)	6	0.50 (0.84)
	No	5	16.20 (19.28)	5	4.00 (6.19)	5	6.20 (8.56)	5	0.60 (1.34)

T-tests were performed on all of the above comparisons, though no significant effects were found on any. Again, firefighters were invited to state freely whether they had experienced any other emotions and comments included: horrific but not out of control, shock, anger, concerned for colleagues – wanting to help them but was not involved [meaning he was not present at the time], emotional [deleted as identifying], sympathy and sadness, sorrow for the victim and his family, and emotional - [he] had had anxiety for the past two months but [he has] not linked this with the incident. Three Participants not did provide an answer to whether they had experienced any other emotion.

6.3.4 Symptomatology

Again, scores on the IES-R indicating symptomatology of PTSD; PHQ-9 for depression; GAD-7 for generalised anxiety disorder; and CAGE for alcohol misuse were administered to the participants. Cut off points are scores on the IES- R ≥ 33 representing the cut-off point for a probable diagnosis of PTSD. Scores on the PHQ-9 of ≥ 20 represent severe; 15-19 moderately severe; 10-14 moderate; 5-9 mild; and 1-4 for no depression. For GAD-7, the cut off points are 15 for severe; 10 for moderate and 5 for mild. Scores on CAGE ≥ 2 indicate probable alcohol misuse and ≥ 1 possible. Severe anxiety and depression symptomatology were reported in contrast to results at T1, increased prevalence rates of PTSD and probable alcohol misuse were also recorded, but this sample is small (*n* = 14). The results are shown in Table 6.11 below.

Table 6.11*:* Prevalence rates of symptomatology in the sample

PTSD (IES)		Depression (PHQ)		Anxiety (GAD)		Alcohol (CAGE)	
Yes	14.3% (2/14)	Severe	14.3% (2/14)	Severe	15.38% (2/13)	Probable	14.3% (2/14)
No	85.7% (12/14)	Mild	7.1% (1/14)	Mild	7.69% (1/13)	Possible	7.1% (1/14)
-	-	None	78.6% (11/14)	None	76.9% (10/13)	None	78.6% (11/14)

6.3.5 Potential predictor of psychopathology: Thought suppression

The fire-fighters were asked: *"Have you tried to suppress thoughts of the incident when they came into your mind?"* They indicated their answers by circling a number representing 'Never', 'Sometimes', 'Often', or 'Almost Always', and their mental health scores were separated according to these

responses. Only one participant responded to the 'Often' category, so their data was collapsed with the 'Sometimes' category. There were no significant differences in mental health measures across conditions. The data are summarised in the table 6.12 below.

Table 6.12*:* Relationships between thought suppression and mental health measures

	n	IES	n	PHQ	n	GAD	n	CAGE
Never	5	2.20(2.68)	5	3.40 (3.51)	4	5.25 (7.93)	5	1.00 (1.41)
Sometimes	9	16.56 (20.35)	9	3.56 (5.50)	9	4.33 (6.78)	9	0.11 (0.33)

6.3.6 Potential predictor of psychopathology: Counterfactual thinking

The fire-fighters were also asked: *"Have you found yourself thinking 'If only' or similar thoughts, which you would describe as regretful thoughts, in connection with this incident?"* As before, they indicated their answers by circling a number representing 'Never', 'Sometimes', 'Often', 'Almost Always', and, again, one instance of 'Often' was collapsed in within the 'Sometimes' category. There were no significant differences in mental health measures across conditions. These results are summarised in table 6.13 below.

Table 6.13*:* Relationships between counterfactual thinking and mental health measures

	n	IES	n	PHQ	n	GAD	n	CAGE
Never	4	1.25 (1.89)	4	2.25 (1.50)	3	2.00 (1.00)	4	0.00 (0.00)
Sometimes	7	11.71 (17.46)	7	3.29 (5.41)	7	4.71 (7.45)	7	0.71 (1.25)
Often	2	33.00 (28.28)	2	8.50 (6.36)	2	10.50 (6.61)	2	0.50 (0.71)

6.3.7 Potential predictor of psychopathology: Humour

Finally, the fire-fighters were asked: *"Have you used humour in relation to this incident?"* They indicated their answers by circling a number representing 'Never', 'Sometimes', 'Often', 'Almost Always'. A one-way ANOVA was used to assess whether frequency of humour used in relation to this incident was related to scores on the mental health measures and this data is summarised in Table 6.14.

Table 6.14*:* Relationships between humour and mental health measures

	n	IES	n	PHQ	n	GAD	n	CAGE
Never	2	26.50 (37.48)	2	8.50 (6.36)	1	18.00 (0.00)	2	0.00 (0.00)
Sometimes	4	5.00 (5.48)	4	4.25 (3.40)	4	5.75 (7.54)	4	1.00 (1.41)
Often	2	0.00 (0.00)	2	0.50 (0.71)	2	1.50 (2.12)	2	0.00 (0.00)
Almost always	5	16.00 (19.40)	5	2.80 (5.72)	5	3.20 (6.10)	5	0.40 (0.89)

The sample sizes were not large enough to grant a reliable statistical comparison, though no significant effects found on any of the mental health measures.

6.3.8 Helping to cope

Participants gave in free response comments that they found the following particularly helpful in coping with this incident. So far as is possible, their words are repeated verbatim here but where the addition of words is helpful in comprehension of a series of jotted notes, such words are included in square brackets. Comments made as to what was helpful in coping included talking to other firefighters, talking to others who responded to the incident, family and close friends, debriefing, sharing experiences, being involved in this [study] process and being interviewed and getting some of his thoughts and feelings off [his] chest, teamwork, the fact that they worked well as a team, the fact that they tried their best to save the victim, and black humour. One participant commented that in the week following the incident he thought about it a lot but now he hardly ever thought about it and that death is part of life [and while] some meet a terrible end, it is still the same outcome. Another said that having been in the fire service for a long time helps [because] other experiences [are] similar! Further, age helps and [you] get more philosophical. Another said he found not dwelling on [the] subject helpful [and that] as per any incident, [you] deal with it and go home, no thinking about what if.

6.3.9 Summary of results

Symptomatology did not differ according to the type of cognitive psychological variable. Depression scores were higher in those who were younger than older and in those who had not participated in body recovery than those who had. These results are limited by the small sample size and could also represent anomalies.

6.4 Comparison of results between T1 and T2

PTSD symptomatology was found to differ according to type of firefighter or rank at T1 but not at T2. Similarly, anxiety symptoms that differed by previous psychiatric diagnosis at T1 no longer differed at T2. Those of a younger age were more likely to exhibit symptomology of depression by T2. Those responding with A2 horror were more likely to have high scores for PTSD and those responding with A2 helplessness were more likely to have high scores for depression and anxiety symptomatology at T1, but not at T2.

At T1, those who attended the initial incident score higher on depression and those who participated in body recovery scored higher on PTSD. By T2, those who had not been involved in the body recovery had higher depression symptomatology, and again this may be indicative of the small sample size and/or an anomaly.

Those who engaged in thought suppression and counterfactual thinking had higher PTSD symptomatology at T1, but not at T2. No differences were found in symptomaology across use of humour .

6.5 Discussion

6.5.1 Aim of study 2

This was a longitudinal study of a sample of firefighters in which predictors of symptomatology associated with PTSD, depression, anxiety and alcohol misuse were explored. The primary focus of this study was to evaluate these in the context of one critical incident, extending the findings of study 1 in relation to multiple exposure.

As was the case with study 1, the primary focus of study 2 was to evaluate exposure to the investigation of relationships between this symptomatology and the psychological cognitive processes of thought control, counterfactual thinking and humour style. In study 2, however, the A1 critical incident was potentially psychonoxious involving the harrowing death of the victim, providing an opportunity to examine the degree to which this exposure affected symptomatology and corresponding cognitive responses.

6.5.2 Major findings

Prevalence of PTSD, moderate or severe depression, anxiety and probable/possible alcohol misuse reported in UK firefighters (*n* = 23*)* directly or indirectly exposed to a CI was 9%, 0%, 0% and 4/9% respectively approximately 6 months afterwards. Approximately fifteen months after the CI, these prevalence rates (*n* = 14*)* were 14.3%, 14.3%; 15.38% and 14.3/7.1% respectively. At T1, 2 firefighters reached the PTSD threshold; none reached severe depression or anxiety levels and 3 showed probable/possible alcohol misuse. At T2, the figure for PTSD remained the same at 2 and for alcohol misuse at 3, but 2 firefighters were now reporting severe depression and anxiety symptomatology. In the short term, PTSD symptomatology was found to differ according to firefighter type and rank; as well as A2 horror; body recovery, and the use of thought suppression and "if only" counterfactuals. Similarly, depression/anxiety symptomatology was found to differ according to A2 helplessness; and differences in anxiety symptomatology were found between those with a previous psychiatric diagnosis or not, but all such differences were short term. Younger participants (under 30) were found to have increased depression over time, as were those not involved in body recovery..

6.5.3 Discussion

Study 2 revealed that these firefighters were relatively resilient to exposure to a critical incident with features which were expected to be particularly psychonoxious, namely that the incident victim died in unusual and distressing circumstances and body retrieval was operationally difficult and different from the norm. Most differences in symptomatology across the variables tested were no longer present at T2 indicating that their effect was not long term, and this includes the use of thought control and counterfactual strategies.

Although the percentage prevalence rates of PTSD were higher at both points in Study 2 than in Study 1, they still fall within the range reported according to Meyer et al., (2012) for firefighters from 5-13% (Del Ben et al., 2006; Haslam & Mallon, 2003; North et al., 2002a; 2002b), and prevalence rates have been found at even higher levels (Corneil et al., 1999; Bryant & Harvey, 1996; Alghamd, Hunt & Thomas, 2013).

The differences in symptomatology of PTSD for body retrieval were not long-lasting. Both the presence and absence of PTSD symptomatology arising from exposure to the dead have been identified in the literature reviewed at Chapter 2. The results of this study support previous studies (e.g. Jones, 1985; Taylor & Frazer, 1982) in that the effects may be significant in the short term but diminish over time.

Supporting Jones (1985) in suggesting that symptomatology may be moderated by social support, it seems from the freestyle comments firefighters made that team support and talking with colleagues and family were helpful in coping. It is important to note that distress arising from body recovery may still be experienced falling short of psychiatric classification.

Strangely, higher depression symptomatology, did emerge at T2 in two firefighters not involved with body recovery. This result may have arisen due to circumstances independent of the incident examined or the result may be a Type 1 error. Finally, symptomatology of depression, anxiety and alcohol misuse increased over the course of Study 2, but in terms of numbers of firefighters affected, only for a small number. This may be due to those being least distressed being most likely to drop out of the study.

6.6 Strengths and limitations

The major limitation of study 2 was the small number of firefighter participants involved, particularly at the follow-up stage. However, two similarly small studies have been conducted with UK firefighters, and this study supports Haslam & Mallon (2003) in finding a low rate of 6.5% (n = 2) of PTSD, but not Hill & Brunsden (2009) finding a rate of PTSD symptomatology of 100% in one watch (n = 6) 14 years after the event. That incident was extremely unusual in that one of the watch's members had died in the incident reported. In all CI studies, the number of participants is, of necessity, confined to those with actual exposure which will be a limited number.

Secondly, although study 2 examined responses following one CI, the possibility exists that attendance at any other CI during the period between time points influenced the results at T2. This is an inevitable consequence of conducting such studies.

Notwithstanding this, study 2 extends the findings of study 1 in four ways. Firstly, it is longitudinal, which is comparatively rare in the firefighter literature (see, e.g. Heinrichs et al., 2005; Bryant & Guthrie, 2005; Bryant et al., 2007; Bryant & Guthrie, 2007). Secondly, it focuses on one critical incident (the CI) providing a comparison between psychopathological responses to such an incident with one group of exposed individuals and study 1's exploration of multiple exposure. Thirdly, it involves a potentially highly psychonoxious event, because of its unusual characteristics, thus providing insight into the factors which may contribute to resilience or vulnerability to symptomatology in firefighters. Finally, it contributes to the relatively sparse literature on associations between body handling and symptomatology in four domains.

The implications of this study for theory, research and practice are discussed together with the other two studies at Chapter 8.

Chapter 7 : "From dead body to person"

7.0 Introduction

The title of this chapter is attributed to Blanshan & Quarantelli (1979) who used it as part of the title of their paper on the handling of fatal mass casualties in disasters. This chapter presents the results of interviews carried out with firefighters who responded to the Critical Incident (CI) reported in Chapter 6. Where the firefighter responders used language which was deemed capable of identifying the incident, it has been deleted.

Some aspects of the CI were unusual. It was not a type of incident for which the firefighters would have received extensive drilling, as they do for road traffic collision response; they could not anticipate what the accident scene consisted of before they arrived; it was a particularly violent death with gruesome features; it involved unusual operational procedures for a critical incident; and it resulted in emotional responses for some of the firefighters which were new to them. Some firefighters rated the incident at the highest end of a notional severity scale, describing it as horrific, but it was also noted for its "off the scale" emotional impact, which was visible in the crews' faces during the incident and on their return. Firefighters also described the effect the CI had on the Service as a whole, evidence of which included the conduct of this Study into the incident.

However, whilst the CI was unusual in some respects, critical incidents involving death in distressing circumstances are not unusual. That it was not beyond the range of normality for these firefighters is evidenced by the fact that some firefighters rated it at the lower levels of severity, describing it as neither the worst nor the most dramatic of incidents. The consensus ultimately was that it was just another job, and most of the firefighters had become sick of talking about it by the time of the interviews, to the point that they were asking whether they really had to go over it again in the Study, simply because they wanted to draw a line under it.

7.1 Rationale for the study

Factors associated with firefighters' vulnerability and resilience to exposure were reviewed at Chapter 2. Of these, perceived severity and body handling were factors in the CI and potentially psychonoxious. Perceived social support, inherent in the firefighter culture would potentially assist participants in coping with the CI, and such support was thought to include the use of humour. The purpose of study 3

was to investigate the CI in more depth than could be achieved through the quantitative data obtained in study 2. It was designed to include a focus on the meaning which the firefighters ascribed to the incident. Further, attempted avoidance of intrusive thoughts through thought control, counterfactual thinking and the use of humour was explored.

7.2 Methodology

7.2.1 Participants and procedure

The participants and procedure were described in full in Chapter 4. Firefighters who wished to take part in an interview were offered the choice of participating in a group or individually. On the first day of data collection, three interviews took place with groups of three, seven and five participants and one individual interview was also conducted, at the request of the participant. A further interview with one participant took place at a later date for operational reasons.

7.2.2 Analysis

Using Thematic Analysis, as discussed in Chapter 4, the recorded interviews were transcribed, coded and themes developed. The study focused primarily on one critical incident, which is referred to, as in Chapter 6, as the CI. Other incidents were discussed as comparisons to the CI.

The three major themes, and their subthemes, which emerged from the qualitative data analysis are summarized below. The first, “What pierces the shield?” relates to the aspects of critical incidents which firefighters report as the most distressing for them; the second, “The J-pegs in my mind” describes the lasting impact of the incident on them, emotionally and cognitively; and the third, “When the bells go down” demonstrates the value of positivity, humour and bonding in living with the thoughts, images and memories of potentially traumatic events.

The participants’ randomised numbers appear in square brackets before their extracted data. Data which has been removed for reasons of confidentiality is signified by the words ‘deleted as identifying’ in square brackets. Interpretation of words difficult to decipher from the tape recordings is signified by the suggested transcription with a question mark in square brackets, or where this is not possible by the

word “unintelligible” in brackets. The words of the firefighters are transcribed as they were spoken, but some punctuation has been inserted where it aids comprehension.

7.2.3 Summary of Emerging Themes

What pierces the shield? The nature of an incident

- Severity of the incident
- The dead and the dying
- Identification with the victim

The jpegs in my mind: What lingers on and why

- Intrusive thoughts and images
- If only and even if

When the bells go down: Mental survival

- Emotion or concentration?
- Humour
- All-action heroes

7.3 Results

7.3.1 What pierces the shield?

There is no universal response to exposure to a PTE, but it seems that it becomes traumatic once an A2 response is experienced (Weathers & Keane, 2007). Gordon Turnbull describes this intense emotional response to an A1 event as “demonstrating that it had ‘pierced’ or ‘penetrated’ the individual’s psychological defences” (Turnbull, 2011, p. 297), explaining that it is the meaning an individual ascribes to the PTE which determines whether or not they develop symptomatology. Such meaning is explored in this section.

Severity

The firefighters were asked to place the CI on a notional scale of 0 – 10, with 0 representing complete insignificance, and 10 representing the utmost significance. The word “significance” was not further explained, allowing the firefighters to attribute their own meaning to it. Almost all firefighters who responded placed it as a 7, 8, 9 or 10. The reasons they had for doing so varied, and it was evident that

the meaning of severity differed amongst individual firefighters. One referred to the impact across the service as a whole, rather than on him as an individual [3201]: *"In terms of severity, the incident that you was referring to for the service I would imagine it would be around about sort of 9, 10 for the impact that it had across the service. For instance, we're actually doing this survey - not many other incidents have done that".* Another firefighter [496] explained his severity level of "up there in the tens" by the role he played in it, which was particularly harrowing. For one firefighter [1828] *"it was the most horrific thing I've ever been to in nearly 13 years".* Another officer [3826] also rated the CI as a ten *"without any hesitation purely because of the horrific injuries …. And you can't believe that a human body can actually go through what that went through so definitely a ten".* However, one [2570] rated it as an 8 "because the guy wasn't screaming"; another [2812] rated it as a 7 because although it was "*probably the worst injuries I've seen to somebody but it wasn't the most dramatic incident I've ever been to"* and it was easier for a third [2570] to come to terms with because the severity of the injuries was such that nothing could be done to save the victim [2570]. Physical proximity was a factor, with one firefighter [986] outside the direct zone of contact scoring the CI in the 3s and 4s.

Many firefighters mentioned smell. One [3516] recognized the smell of hydraulic oil and then realized that although it was indeed oil due to the nature of the accident, it was *"mixed in with bodily fluids and after that I wore the mask"*, which did not entirely prevent detection of the smell. Another [496] said "*we underestimate how strongly of an impact that is on our brain and our memory, and this incident we did have masks on, but we still got some of the smell. And I have been on other incidents where smell's a major, major factor that affected me*".

The stress the firefighters were under was palpable to one [3201] on seeing the crew returning; *"the way that they were telling me and putting it across you could actually see it the stress in their face and the way that they were putting it across".*

The dead and the dying

One firefighter [3826] speaking of the effect on him of seeing a dead body, said: " *I can picture very clearly all the dead bodies I've seen through my 22 year career … some of them are unrecognizable, certainly those ones in fires, so it's not the same as seeing somebody that's pretty much intact and something's happened to them and [they] died. Seeing a dead body definitely has an effect and going through my father dying of cancer sort of brings that back and, you know, I was there the day he died so*

I can remember seeing him alive, and then minutes later, seeing him dead so that probably will always have a lasting effect on me seeing a dead body and brings up some memories of my dad". So, for this firefighter, the experience of confronting death in his occupation has personal meaning because of the loss of his father, which is brought back to him repeatedly at work.

The fact that the casualty was alive when the first firefighters arrived at the scene was significant because the firefighters did find the manner of dying stressful. One [496] described the death of the CI victim as "*unimaginable*". However, another firefighter [3826] who witnessed the dying described the body retrieval as "*probably much more horrific than actually seeing him die in front of us".* For the body recovery crew, an added stressor was the apprehension they experienced beforehand, as they had time to dwell on what they were to face. One [882] was apprehensive because he knew he was going to be involved in the retrieval of someone who was already dead, and one [1490] commented that the firefighters "*therefore had plenty of time to play it over in our mind and actually come up with all sorts of scenarios .. and I think that that period I was quite apprehensive as to what I was gonna go to"*.

Perhaps some aspects of the incident were hard to accept as they were so unusual. One [3201] appeared to cope by denying the reality of the scene *"… something switches and you just get on with it and just deal with it"* explaining that *"you kind of make it that it's not real what you're actually seeing - like a hand just on the floor or something like that - you just, I don't know, you just look at it and think, 'Oh, that's just make-up or special effects or something like that' ".* Another [1828] faced with a sight that literally did not make sense to him at the scene, experienced it as "*like spotting the deliberate mistake because it didn't belong in the picture. It didn't look real"*. It was, in fact, real but so *"bizarre … surreal"* that it felt unreal. It is inappropriate to describe what he saw, but it is an image the firefighter still had.

Identification with the victim

The greatest impact on firefighters seemed to occur when they were not able to detach from the incident because there had been a personalization of the victim, a process which transformed a dead body to a person. Personalization develops for all the firefighters responding even more through the face and, specifically, the eyes. One firefighter [1490] explained this: *"I think the face it actually makes it quite personal because this is how you recognize, tend to recognize, people and so you once you can see someone's face then it starts to put this person, it starts to bring their personality and everything into*

light". Another firefighter [496] said, "*without a doubt for me a headless body would be easier to deal with than one with a head on".* For another firefighter [3516], the expression on the CI victim's face, which indicated the pain he was in, was *"a bit hard for me".* Eye contact appeared particularly crucial in personalizing the victim. A firefighter [882] described the impact as *"I think if their eyes are wide open and they're looking at you, you get that sense of that they're looking at you. I don't know whether it's like that, you know, 'help me' or whatever it is, whether they're alive or dead".*

To avoid personalization, most firefighters actively avoided looking at the face of the victim, as was their custom when dealing with the dead. One [3516] simply stated *"If I don't have to see the face, then I never look".* Another, [496] said *"you avoid looking straight in the eye"* and doing that and avoiding the face "just masks the impact a little bit and distances you". Another firefighter [3516] commented, "*I will always remember that face"*. In order to cope, one firefighter [1490] said in relation to a body, *"I consciously don't focus on it during the course of the incident, definitely don't look at the face if I can help it, and even when I am looking at what I'm doing, somehow I manage to put that to the back of my mind so that later on it is very difficult to recall".* Another [882] said "*you don't want to become attached to them, you don't want to get your focus took away from the job that you're doing and I think, once your focus goes from that, then you might as well just step back and let someone else do it like".*

However, seeing the victim's face and eyes is not necessarily distressing for all firefighters. One crew member [3327] said "*even though I had seen his face, it wasn't something actually that I recollected when I had thoughts about it the next day, when I woke up and stuff like, it wasn't his face that was I was thinking, just the whole thing really, and it wasn't something that I dwelled on after".*

One [496?] remarked "*I don't want to know a name particularly. I don't want to know their background. I don't want to know someone that knows them. Then I can detach but, like you say, when you start knowing people that know them you start reading you start having names. So , soon as you get names and families you start thinking of people outside that are involved the loved ones left behind"*. Another firefighter [2570] felt the CI was easier to come to terms with partly because *"I didn't actually get to learn the guy's name".*

The firefighter [1490] who avoided looking at the face found hearing about the history of the CI victim put *"some kind of personality to the person, and then that sort of makes things more difficult",* but he hadn't got *"much of an image of the person at all now".*

Other features of the CI seemed to prevent some firefighters from being able to distance themselves entirely. For example, it occurred just before Christmas, and several firefighters found this timing upsetting. One [1828] said *"I can't remember the exact date but it was just like 'jeez what a shitty time' sort of afterwards when I had time to actually think about what had happened and … the repercussions from that so the family being told and someone's Christmas going to pot and all the rest of it. That's what kind of upset me".*

7.3.2 The jpegs in my mind

This title originated from one of the firefighters who, as will be seen below, does hold images in his mind like snapshots, but this theme also describes negative appraisal of the incident through the persistence of intrusive thoughts, counterfactual thinking and regret.

Intrusive thoughts and images

Thoughts or images of the CI did not generally seem to come into the firefighters' minds spontaneously but were more usually generated by triggers or cues, particularly by people talking about it. Unsurprisingly, in the immediate aftermath, several of the firefighters did think spontaneously about the CI. To a certain extent, this was due to the nature of the incident, but there were other factors, such as the need some felt to talk about it. Unusually, after the attempted rescue, the crews were at the end of their shift, so there was not an immediate opportunity for them to sit and discuss it amongst themselves. Instead, one firefighter [1828] "*had nothing planned and ended up phoning a mate and saying 'oh mate, you won't imagine, you can't even imagine the day I've had. I need to come round. Get the kettle on".* The first time another firefighter [2570] thought about it "*was the night after the incident and I remember I went to the pub and I had some drinks and tried to come to terms with what had happened that day because I suppose I was still a little bit in shock*". But he went on to explain that after that, although he thought about it sometimes when he was by himself, he also did *"when I meet someone or someone introduces me as a firefighter and people ask about a job and they ask you: 'What's the worst thing you've ever been to?' and that normally comes up in my head then".*

Even though images came unbidden into some firefighters' minds, several reported no lasting impact. For one [3327] these images were like *"any time I've ever remembered a dream really. I'd sat there and tried to sort of remember what I was just thinking about when I first woke up, and then I just carried on as if at any other time that I remembered a dream really".* He went on to say *"I just thought about it a little bit and then carried on regardless. It didn't - it wasn't - a conscious thought to stop thinking about it or to think about it more really".* Similarly, one firefighter [3878] while agreeing that that images did come into his mind, was quite philosophical about it. Images appeared *"after talking or somebody mentions it and then they just go. I just, life goes on, don't think about it anymore, and just carry on as the day was meant to be".*

Unbidden images did not occur for some, but even when triggered, often by someone else talking about it, again there seemed to be no long-lasting impact. The arrival of the interviewer herself triggered thoughts and images of the CI; and some found that one incident reminded them of another. One [2570] said *"I think it always comes in a wave so it could be you're in your car driving and you drive along a certain part of a road where you've been to an RTC and you've had to deal with someone who was badly injured and then from that thought arising it always seems to end up in the incident that we attended".* But not all firefighters agreed, shaking their heads or saying "no" in answer to the question whether anyone else found that one incident reminded them of another. For others, talking with each other was helpful as one [3201] explained that he was *" quite lucky with my lot that we are quite all open and we do all talk quite a lot quite regularly so I'd say for us we actually talk about jobs and incidences quite a lot".* But not all firefighters managed to deal with the intrusion of images or thoughts. For one firefighter [3826] who had had "*probably the most horrendous sleep I've ever had in my life with all the things that were coming back in my mind about the incident … those pictures, those images of that incident haven't changed - they're still as, probably as bad as, they were the day that it happened".*

The manifestation and impact of images was eloquently described by one firefighter [3826] with long service: *"… and the images of that that incident I look at in my mind, as I can just flick through a load of photos like they're on an i-phone or an i-pad and just flick through 'em from the start of actually getting there, seeing the faces of the crews seeing the [deleted as identifying] on the floor, seeing the images of the [deleted as identifying], and just flick through all the way to the minute we'd actually got the body out, and the horrendous smell and looking at, you know, the guy getting put in a body bag, and the sort*

of clear up at the end of it. So, I've probably got thousands of pictures and sort of like videos in my mind of all the things we done [and?] you know certainly some of the more horrific things that we had to do to try and remove him I can sort of picture those very, very clearly, and just sort of flick through 'em as if I wanna go from the start to the finish [inaudible]. Over that [deleted as identifying] period I can go from start to finish without any sort of interruptions in between or any sort of gaps. I can remember all of it very, very clearly".

This firefighter had developed a method of dealing with these images. He [3826] said *"I think I try and put them to the back of my mind, and just try and try and whizz through 'em so quickly that I can't actually see 'em so whether that's me coping with it, or whether that's just the way I try and deal with it, I don't know".* He tried to speed up the images *"so as if you was whizzing you through pictures that you don't wanna see".* However, it was not entirely successful, in that *"when you come to the ones that you're either dealing with or thinking about, you'll then get still shots of it or a video version of that".*

If only and even if

Notably, little mention was made of thoughts occurring when a rescue attempt did not go as planned. It was acknowledged that when things do not turn out well, thoughts may come into the minds of the firefighters as one [3201] said "*or if it goes wrong, they're the ones that do make you sit and think about it weeks or whatever after the job's been and gone".* Others agreed that they looked back on jobs and asked themselves whether they've done the best they could. But they instinctively understood the dangers of upward counterfactual thinking. One firefighter [882] commented: *"like the others have already said you look at it and, as long as you've come out from that job and known that you've done the best that you could have done, then I don't think there's any problem. The problem starts arising when you start looking at it and think 'oh actually, we should have done that, should have done this if I'd only done that' ".* Another [1490] described the exhilaration which arose from preventing something being a lot worse but conceded that *"you can also have the opposite. If things are not going well then you can, you know, you can feel quite down about it coz you know, if only I'd done that".*

Upward counterfactual thinking and expressions of regret were relatively uncommon with these firefighters in relation to the CI, the most frequent example of the former being in relation to the fact that the incident happened at all. One [3878] was baffled as to how it happened, saying *"I can't get round my head why …"*; and another [3826] said *" … I feel that I would like to change things … so this*

incident wouldn't have happened". As the CI involved a victim who could not be saved, it was anticipated that the firefighters would experience "if only" thoughts related to his death. This did not, on the whole, transpire. Even when one firefighter [2570] described sometimes thinking "… *that I wish we could of brought him, you know, got his heart beating again"*, he recognized, with hindsight, " … *that was unrealistic and to be honest, we probably did the best that we could given the injuries".* Others reinforced this view, with one [3516] saying he had no regretful thoughts as "*to me, it was unsurvivable"* and another [2812] said he didn't have any thoughts about what he should have done because "*after once we got there and saw the state of the casualty I didn't feel like we could have done anything. It was such a bad incident".*

Decision making emerged as a marker for potential post-accident reflection and counterfactual thinking. Again with hindsight, one firefighter [1490] said that *"the lads that were outside the incident and they felt detached from what was going on and I did think that was a bit of a learning point there for me because it's about keeping people informed, and making, trying to make them feel part of the end result as well and not just bystanders. So that was an 'if only': if only I'd thought of that at the time and maybe could have dealt with that better than I did".* But although difficult decisions had to be made in unusual circumstances, they did not appear to generate upward counterfactuals. Very early on in the incident, the officer in charge [1828] had to make decisions as to the next actions of his crews, having been informed that the ambulance was 2 ½ minutes away. Looking back on those decisions, he said *"So I probably, if she [the ambulance operator] hadn't of said it, I probably wouldn't have done any more [or] less than we did do because it was 2 ½ minutes, and we wouldn't have got to the point of cutting and we wouldn't have got to the point of getting him out".*

In one of the most difficult decision making processes in terms of roles and action taken, two firefighters agreed on a decision, which they reflected on subsequently. One reported being happy with his decision, the other less so, having experienced guilt. But even so, he engaged in downward counterfactual thinking, rather than upward. The decision under discussion went to which of them should carry out a potentially distressing action. The one who finally carried it out [496] reported "*and I think even though, it yeah it turned out be me, coz I said I'd rather do it than ask someone to do it, I think I feel better about that within myself than if I'd have asked someone to do it and they would have been upset by the situation. So in that way, I'm perfectly happy with the decisions that I made, rather than make someone else do it, and then I'd feel, I think I'd feel, more guilty for them than for me".* Although

the other firefighter [1490] agreed that it had to be one of the two of them, he did experience feelings of guilt that he hadn't undertaken the task, saying *"You know, I felt that, you know, I didn't necessarily, I maybe should have pushed myself forward a bit more"*. The guilt described was felt in relation to a fellow firefighter *"because I put someone else in a situation that that I could have perhaps taken that burden".* Interestingly, they had not argued about it, and as they discussed it at interview, they were bantering as they did so. This part of the incident did replay in those firefighters' minds, causing them to reflect on whether they could or should have done anything differently. But they exhibited no upward counterfactual thinking. One, [1490] said *"I'm trying to, trying to think of alternatives although I can't believe that there was any alternatives with what we did, and I felt at the time that we did a fantastic job with the circumstances that we were given".* The other [496] who carried out the task which *" stuck with me for a little while and probably will for a long time"*, expressed his thoughts thus: *"Looking back at it, I've got some positive thoughts coz I think we was very professional and we done the best job we could with what we had, and I don't personally [think] I'd do a lot of things differently".*

An equally poignant illustration of decision making did lead to regret. One firefighter [496] who was closely involved in the body retrieval struggled later with whether or not the casualty's head should have been covered up. On the one hand, he said *" yeah just, I think in in hindsight and listening to other people that were there, I wish we'd have covered his head up".* At this point there was an unidentified noise of agreement. He went on to say *" Because then we would [not?] have made such a physical contact with the person; it would have been just a job … that you can deal with"*. He did toy with the idea at the time, but *"I didn't know, I felt as if it wasn't showing the casualty enough respect if I'd have bagged his head".* He said *"I was trying to show that person, even though they're dead, some sort of [respect] in my own little world".*

This expression of regret illustrates well the dissonance he felt in having to choose between showing respect and protecting his men. In hindsight, at the time of the interview he [496] felt that his desire to show respect *"maybe it was misplaced maybe I should have been looking at these lot more and actually covered him up".* Similarly, for the firefighter [1828] who experienced feelings of guilt at the time of the CI in ordering his crew to administer oxygen to the casualty, this officer was not concerned with his own welfare "*but I was thinking more about them. And I remember saying to [a friend] ' I just hope they're alright, and maybe I shouldn't of got them to go up there".* He knew he was not asking them to do anything any other commander would not have asked, and that it was their job, but he was reassured

when he raised the issue with them and "*they told me to stop being stupid [laughing] and they're like, ' well that's what we're 'ere for, that's our job, that's what we do. So you haven't asked us to do something untoward or out of order'. But, yeah, I just got quite upset at the time".*

There were feelings of lack of support and lack of procedures in place to deal with an incident such as this. One firefighter [1490] described a *"period of time where the Service was in a bit of limbo as to how we should have progressed, and it was because there was no real clear guidance as to who was supposed to do what role, and it was left to us to actually take the bull by the horns and sort the situation out".* He went on to say *"I didn't feel the Service necessarily supported us as much as they could have done because there was a, there was a split between certain officers and the way they felt things should have been done and the way we did things, and again, you had to be there to you know"..* He added, that (as of the time of the interview), *"And I'm hoping that something will happen but as far as I know we're still in … if it happens again, we're going to be in exactly the same situation".*

What the firefighters did find frustrating was other people's attitudes to the way they performed, particularly as they were from people who weren't there. One [496] making it clear that he was not comparing himself with a soldier, was able to empathise with the military, saying *"I can imagine it's a bit like the geezers coming home from Iraq, people criticising them for the war when they're doing the best they can with what they've got".*

Aside from these upward counterfactuals, expressions of downward counterfactuals were almost universal with professional pride and a strong sense duty clearly emerging. One firefighter [496] explained that the role of the fire service is *"kind of the last resort, so we have to do it".* As he described it *"I think we had to do something and we are the fire service. We're always put in them positions where we have, we have to have a result, we can't not have a result, do you see what I mean?"* In other words, the fire service can't just walk away, leaving a fire burning or a person trapped in a vehicle. This was echoed by another firefighter [1828] who said *"We'll always go there, we'll do our job, we'll get 'em out, we'll hand them over to the ambulance or doctor or whoever it may be, but we'll always have done that and we'd have completed the task".* He confirmed how the CI differed from the norm at one point but said *"And I didn't really think about it and it's only now talking about it, that it is the only job I've ever been on where we [deleted as identifying]".* However, he and his men had done what they could, he fully understood why this operation differed and for him it was *"just like, yep, right, OK, fine, just make*

sure we get all the kit back on the pump. Let's get back, let's get showered up and let's go home". It would be easy to see this as heartless, but it clearly was not. It was an acceptance of a difficult situation and a concern to ensure that all the firefighters, who had done all they could, should now depart the scene.

The consensus of opinion seemed to be that it was, in the end, just another job. As one officer [1828] said *"Talking about it brings them [thoughts] out but, and I suppose maybe that will always be with me, but in a general scheme of things, but I think we all just look back on it and think ' yeah it was just another job '".* It was good to hear what he said next: *" I think most of the guys [laughs] are sick of talking about if I'm honest and they have said that"*. The crew appreciated their Station Commander's openness and understanding with them, but they had got to the point where they didn't want to discuss it. They felt the same way about the interviews "*knowing that you're coming in tonight the guys [laughter in voice] are like fucking hell [quietly] ... this job again do we really have to go over this job again [laughs] But I don't think it's coz they're scared to go over it. I think it's just people wanna to draw a line under it and say 'it is another job, it was just another job'. I think this does help, and I think some of them are affected by it, and I know that. I can see it in their faces - I've known some of them a long time, and I can see it has affected them. But, yeah it's: it is what it is and it is just another job".*

7.3.3 When the bells go down

Emotion or concentration?

Of the DSM Criterion A2 emotions, only helplessness was mentioned, and this was by a firefighter [1828] with a senior role at the outset, who knew from the ambulance operator that nothing could actually be done, which made him feel helpless. He was able to alleviate some of his feelings through ordering the administration of oxygen to the casualty, *"it was the only thing I had which I could sort of offer".* Unfortunately, the very fact that he had taken this decision subsequently led to him experiencing guilt when a debate began as to whether the CI victim was alive or dead at the time: *"Part of me, especially the next day, I felt really guilty about asking the two guys to get up there and putting them through that to work on a casualty which really in my own mind, part of me was - and it was part of me - was convinced that he was already dead".* He spoke both to the men he ordered to administer oxygen and to his Station Commander about his sense of guilt, saying to the latter, "*Look, I just felt bad for tasking two guys to work up there on a guy that part of me was already convinced was dead, and that they were banging their heads against a brick wall, and I was exposing them to the trauma of trying to revive someone who was already dead".*

The depth of the officer's sense of helplessness is illustrated by the relief he expressed when a more senior officer took over command of the incident *"Yeah, it was a relief because it was, it was because of the severity of the incident and his injuries. It was 'I'm quite happy to hand this over and let someone else take the lead on his who had got more experience than me".* Nothing could prepare him for what actually happened at the incident scene: "*I just didn't expect it to end the way it did and I didn't expect to get there and find what we did and feel so helpless as I did".* For him, a combination of the severity of the injuries, the helplessness he felt at not being able to rescue the casualty, his role in command and the subsequent guilt he experienced at putting his men through attempted resuscitation caused him significant anguish. He said, ***"****But no, nothing's really ever upset me, nothing's ever brought me to tears, but this did".*

It is possible that the dominant mental attitude during responses to incidents is less of an emotional nature and more of concentration or focus, and these were mentioned by many of the firefighters. As one [3327] described it*, "bizarrely I always thought that I'd have a lot [of emotion] although I probably do have quite a lot adrenaline going when I go get turned out and on the way to calls [but] I actually feel*

really calm and sort of conscious thoughts of emotions don't really go through my mind. Bizarrely, the only time where I ever feel sort of like a conscious emotion would be if we get a call to [inaudible] like a house fire, persons reported or somebody trapped or something along them lines, when we know there's definitely somebody that we have to go and save so to speak. And then it almost just focuses your mind and you concentrate just a little bit harder, and that's the only time where I ever feel any other emotions. Apart from [that], I actually just feel quite calm. I feel quite, I think my mind just clears itself and I'm thinking about the incident rather than other things, really". A possible reason for this ability to switch off, or act on autopilot as some described it, was likely to be through training, drilling and procedures. As one [2625] commented: *" yeah, all incidents are different, and so you do deal with them in different ways . Sometimes they can, you sort of switch off and just take the job as it is and almost everything becomes like procedures, like what you've been taught to do and you do kind of switch off".* Another [3201] offered, *" I'd say it's because you're just drilled you do it, you know about things. I'd say you're actually in your comfort zone as well, because we do the training and we know what we're doing".*

Another reason for focus on concentration was due to the need for allocation of roles and making plans. As one firefighter [496?] said of the CI: *"I probably felt better about things because I was focusing on the task because of the job we've got. It's my job to allocate jobs, to get the task done, and that helps me to focus so I don't have to think too much about the incident. Often, when I come away from incidents, they upset me more looking back than while I was actually there because I've got a job to do".* He and another firefighter had worked out a plan and "*I think we had a great plan, we had a plan b and a plan c and we stuck with it and that helps us to focus on what's going on".* Again with reference to the CI, the officer [1828] who reported a feeling of helplessness, was conscious of no other emotions, but was concentrating: *"And I was focused on doing the things we could do in preparation for the ambulance to arrive".* Perhaps emotions break through this focused concentration (which may be part of a shield of resilience which firefighters have developed through training) by jarring occurrences such as the ringing of the victim's mobile phone or sudden identification with the victim through eye contact. But less personalised occurrences can have the same effect. One firefighter [3201] explained how *"when you come up to another slightly quirky or little bit different RTC that's when it can stop you being out of a little bit of autopilot and its 'oh what do we do with this bit?' So, experience is a massive thing and if you haven't got anyone else that's not seen anything or dealt with that situation, then it does tend to make everyone slow down that little bit more and put a bit more pressure on you"*

Humour

Anecdotal evidence, time spent with the firefighters, the results of Study 1, and the literature all suggested that the extensive use of humour for firefighters constituted a combination of a coping mechanism, a bonding mechanism and an internal language. Despite the nature of the CI, the interviews were punctuated with laughter and witticisms, an example being when the interviewer asked a group, "Can I just ask you then, do you think humour helps to detach yourself from the incident, or how would you describe it? What exactly does humour do?" The deadpan response was *"It makes you laugh".*

How and why humour worked for them was expressed in different and intriguing ways. One firefighter [3201] gave an overall view: *"I'd say humour ultimately is used a lot of the time in most jobs good, bad, ultimately a lot of the time. It's, I would suggest, it's used to actually distance yourself from reality from what the actual jobs are. And also I'd say it actually builds bonds and brings the watch, the crew etc closer together, and it's like an experience that they've shared so they then put it into their own terminology, their own sort of lingo, to protect others as well from being able to understand what they're going on about as well I'd suggest".* The bonding concept of humour was echoed by a firefighter [3201] who said *"I'd probably say that it tends to be probably the easiest way for most people as a collective to probably deal with stuff so it's just the way that everyone sort of rolls with it".* Another [2812] offered *"I feel like the joke once it's said, it brings the group together, brings everyone having a bit of a laugh and puts everyone we've all got something in common which we have anyway coz we were at the incident, but it just makes the air, lightens the air, relaxes people".* The release of tension through humour was mentioned by several firefighters, one [unidentified] saying: *"But it also distracts you from a situation because your mind's taken it in and the more that you take in that situation the more intense it becomes, so the quicker you can detach yourself from it, makes you relax and then, yeah, you can basically relax …"*

Another firefighter [3826] considered that *"on a day to day basis, helped us all, it broke down barriers at times. It, you know, people had their own issues in their personal lives or when we went out on incidents we would come back and use humour as a way of, you know, breaking down people's barriers- new people, old people, whatever it was on the watch - it would always be used as something. And I've probably never laughed and smiled so much as being on a watch with firefighters. So that the way the humour's used is, you know, it is to also increase the bond between people. And, you know, you do*

become a second family and humour is always gonna be part of that even, you know, even in our day of political correctness, humour's still used in various forms to keep us happy make us laugh and er for us to to cope the way we do".

One intriguing and unexpected use of humour was to change the emotional impact of images held in the firefighters' minds. All firefighters in one interview group agreed with one [882] who offered that humour puts *"the pictures that we have of the incident turned into a more humorous way so that we can actually deal with it in our own little ways",* literally transposing negative images into positive ones. This was supported by another firefighter [3826] who thought *"from experience, humour in the past has, I think, it helps erase some of those feelings some of the things you actually picture and you got in your mind, albeit some of those pictures don't go, but it does help".* How this is actually done was explained by a firefighter [3516] with reference to the CI. He said *"I have the image of the man and maybe the smell, but more often than not, when I think of it I do laugh because within a few hours, I gave [496] a bit of a nickname for his role in the incident. Which he did say to me he thinks it was a bit too soon to start taking the piss out of him, which I thought about for a few minutes and then carried on".*

This firefighter felt that giving nicknames was a way of detaching oneself from the incident and he had found that "taking the piss worked". He described an incident early in his career in which the support he was given was *"very lovey dovey and cuddly"* but that didn't work for him. Then *"someone just started taking the piss out of me and I found that worked and so very early on I decided I'd not be very receptive to counselling, so that was it really".* But the firefighters made it very clear that nicknames, taking the piss or any other form of humour was not, as put by [3201] *"to upset people or anything like that"* and by [882] *"it's not meant to be any malice towards the family or to him [the victim]"* and [2570] *"not in a mean or demeaning way upon the casualty".*

The possibility that humour emerges as an acceptable alternative to the expression of other emotions - perhaps less professionally acceptable ones - was acknowledged. One firefighter [2625] suggested *"humour's an emotion that people don't mind expressing, so maybe subconsciously it's better to get a humorous emotion out rather than a different kind of emotion that you might be worried about showing".*

The use of humour in the CI does not appear to have been experienced in the same way by all firefighters. One firefighter [unidentified] said that it was exactly the same as in other incidents, even though this one was very unusual. He reasoned that *"it makes it something more normal if we react to it in the same way and, if we reacted differently, then it might escalate in our minds to the severity of it and probably make it worse for us psychologically".* But for two firefighters, possibly because of their position and the roles they played, experienced humour differently. One [3826] said *" It's this incident was very unusual in the fact that no humour, as far as I know, was ever used either with the crews, myself or any other individual because of the severity of it".* He added that *"this was probably the first incident that I've witnessed that humour wasn't used as part of our, I suppose [not?] a coping mechanism, but the way we use to deal with issues …"* Similarly, for the first time in his career, one firefighter [1828] did not want to come into work the day after the incident because he anticipated that humour would be used. He described his trepidation, *"I'm not in the mood to be taking it so I'm just gonna have to have words. I had to actually sort of think through my head about what I was gonna say in terms of 'look mate, I just ain't in the mood for it, I don't wanna hear it'. I don't wanna hear the jokes coz I wasn't at that stage then to hear the funny side of it".* As it transpired, he found the watch *"looking quite so solemn really around the table and they'd had a day of it and they'd been through it all that day and they weren't, there wasn't any funnies".* He breathed a sigh of relief, *"because they all probably felt the same as I did or worse, I don't know, but they, no-one was in a mood to joke about it that following day".*

In the CI, there was no humour reported during the response itself, indeed, one firefighter [986] commented that he had never seen anyone *"take the piss during a job, ever*", and its absence at an incident scene was explained by another by the concentration and professional pride they have in their job. Rather, they agreed that it starts immediately after the response is over, with one [1490] saying that it starts *"almost as soon as you're moving away and the stress levels start to come down".*
For some, this did not differ in the CI, with one [2570] reporting that "*immediately after the incident had closed and we withdrew from the risk area, humour was used within our group."* Again, this was not the experience of all firefighters. One [1828] thought that the jokes had started about a week after the incident. It is possible that, given his role, this firefighter's crew deliberately held back from him the jokes and banter they were exchanging between themselves until such time as they thought it was appropriate to let it start. His reaction at the time was *" 'Oh jeez, you couldn't be more distasteful if you tried'. And maybe this isn't the job that we should be cracking funnies about but I dunno whether it's in*

our nature or we've just but it is how we deal with things". But as he spoke, the officer laughed, appearing relaxed and reconciled to the use of humour his crew had exhibited.

For some, the humour was felt to have gone on too long, and that what had started out as positive had become negative. As one firefighter [1490] put it ***"****one thing that that did come out is although we had the humour and the banter and it went on for some period of time, I think after a certain length of time it started to work the opposite in as much as people started 'right, we've done this enough now and I don't think we should be doing this anymore'".* An unidentified "yes" was heard in the background.

Although severity of injury sustained by a casualty does not exclude the use of humour entirely, all firefighters agreed that if children or young persons are involved, there would never be humour. As one firefighter [2812] remarked *"I feel that if this incident did have kids involved, we wouldn't have used humour at all" .* Another firefighter [3878] explained that, if children were involved in accidents, his initial thought would be *"anger, because children are, they look up to us as adults and we sort of have to look after them so it's as adults we need to protect them".* Humour would be out of place and unthinkable.

The firefighters' "piss-taking" style of humour seems to be learned as those who discussed this suggested that it develops over time, so that on recruitment they are slightly shocked by the irreverence, but that they learn either to tolerate it or to use it themselves. One firefighter [2754] said: *"Initially when I joined this job, I think one of the first fatality incidents I went to, I was quite surprised at the amount of humour that was going on"* but he personally felt *" I don't know if I can see myself behaving like that, it's just not my way, but like I say everyone has their different ways of dealing with things"*. Another [1828] said ***"*** *I remember joining, when I first joined, and I remember sitting there as a recruit and people saying things about different jobs and I thought 'there's something wrong with all these people' and 'what on earth have I got myself into here because I don't feel like that and am I really gonna feel like that, can I really make light of someone else's misfortune?"* He then said, *"But I have grown into that person…"* However, although he would have a laugh, he *"won't really ever be the one to lead on that … but, at the same time I won't take offence in others doing it and I will laugh and I will joke and I will see the funny side of it"*. As he spoke, this firefighter laughed, gently.

All-action heroes

Firefighters are each other's second family and the closeness of the bonds between them was evident during the interview process through the way they interacted. But it also came up repeatedly throughout the interviews as a vital aspect of their job, running through every other subject and theme. The watch system which automatically creates teams is protective, particularly when making decisions, as described by one firefighter [3201]: *" Just saying about making decisions, generally you're always in a team so it tends to be quite easy to make the decisions 'coz you can always chuck ideas off each other".* But he recognized that there were times when firefighters had to cope alone, *"… I don't think there's any sort of training or support that people give you for that. It's you've just got to find your way sometimes".* One firefighter [1490] commenting on how often he's asked how he copes said, *"I do find this quite an easy one to answer because to me the one thing that really sticks out is teamwork. And because you're part of a team and, although we've all got our own specific roles and we might have to be making the decisions, but we're still part of a team that's then going to carry the whole thing out and so, ultimately, you don't take the whole responsibility yourself; you can share that amongst the rest of your team and I think that's what really makes the whole thing a lot easier to deal with".*

Firefighters showed the same pride, respect and reliance on each other that one would expect to find in this "second family" to which they belong. It helps them to cope, and it keeps them bonded, as illustrated by one firefighter [2570] responding to the CI: *"… one of the things which has helped me come to terms with it, and deal with it, was the pride that I felt between us and our fellow firefighters".* The biggest positives were, according to one firefighter [3154] "*the respect for the first crews that got there - they had to deal with what was hopefully going to be a rescue";* to another [3186] the best part *"is when you look round and see the blokes who are with you and you know you can rely on them";* and for another [3826] *"when you get back to the station, you talk about it, again in that family environment with the watch, so and then, you know, potentially you get a bit of praise from the bosses".*

Professional pride was manifest in the firefighters' evaluation of the CI: (unidentified) *" … We were the first emergency services on scene. I don't feel that anyone had to be asked to perform their duty that day; we all just cracked on and got on with the job. As a team, we worked well together. I felt that I was glad for the experience to happen because, if I can learn from that experience and it can benefit me at*

another incident that's a good thing". One firefighter [unidentified] who was closely involved in the CI summed up the professionalism when he said, *"And I would rather, I would never have not gone to that incident knowing that it was going to happen. I would never have sent anyone else in charge because as a professional I'd want to see I want to test myself as well".*

The importance of the support crew members give to each other was evident in the way the CI was handled. One firefighter [1490] deployed the whole watch because *"I felt we needed to support each other with this one … which also helped longer term because there was more people involved and could discuss what happened".* His colleague [496] actually picked his crew *as "there was people that I thought perhaps wouldn't suit the incident and may be affected more by it".*

Support was also obviously critical in the aftermath of the CI. There was no debrief after the first part of it during which the casualty died because the crews were at the end of their shift. But at the very end, the Station Commander stayed behind after the body recovery to talk with the firefighters. He also talked about how he had been affected, volunteering his own feelings first. One firefighter [1828] described this as *"the greatest comfort to me".* He explained, *"I've never heard an officer be quite as open as what he was and I sat there thinking 'Thank God, someone feels the same way I'm feeling now', because I was thinking 'Am I just being soft, am I letting this get to me, or is this affecting me too much?', but then everything he said it was like 'jeez'-. it was, again it was, another sigh of relief really 'coz I thought I'm so glad it wasn't just me. And he was saying it was the most severe thing he'd ever seen and he got home and he felt alone and he felt isolated and so on".* The effect of the Station Commander's words on the firefighter [1828] was profound: It did *"sort of lift my spirits a bit in, not taking any sort of pleasure in his unhappiness, but it just made me feel human and it made me feel normal and it made me just think 'yeah there's nothing wrong in feeling the way I feel and I'm not alone in the way I feel'".* This is a poignant example of common humanity, a key component of self-compassion which is vital for well-being (Neff, 2003).

The tone of the interviews changed perceptibly when the firefighters reflected on what they loved about their job. They reported positive emotions including relief, excitement, exhilaration and professional pride. In fact, these positive emotions were far more readily expressed than negative ones, and according to at least one firefighter, they far outweighed any negative emotions. They knew that experiencing positive emotions could be adversely construed, and they all recognized that their

responding to an incident meant that something bad had happened to someone else. Without exception, they strove to explain that their positive emotions were not experienced without understanding the circumstances in which they arose, which is potentially quite dissonant. One firefighter [3826] explained: *"I don't think I've had many positive thoughts when the bells go down 'coz generally that means something's happened, there's an emergency somewhere, someone needs rescuing, someone needs cutting out of a car, someone's got a fire".* However, he was able to come up with several examples of positive outcomes, and as another [1490] put it, **"** *I find a lot of positives in what I do even though most people when they phone us are having a very bad day. Our involvement is actually trying to improve that bad day and that's the only bit I can take from it even though there could be all sorts of trauma or all sorts of tragedy, I'm sure that what we do actually improves that situation rather than makes it worse".*

Another [1490] described the satisfaction he can derive during an incident *"if I know that the job's going well you know you you've got a house fire for instance and it looks pretty involved and you know you've made some good decisions your team's working well and you think right I've got a good stop on it bit of jargon, you know."* A third, [3826] described how he felt in the aftermath of successful shouts, *" … Or get the family that that you've cut out of a car actually coming in and visiting you at the station, that you know those feelings, those emotions, you know actually physically make you want to cry because you think 'you know, that's what I'm here for and that's the job I do' and people appreciate that generally which is very positive".*

Another [1828] described it as *"a guilty pleasure"* because he knew and understood that *"even if there's no-one injured, I know that that someone's property, I know that that's someone's house, I know it's someone's car"*. This dissonance was described by another firefighter [1490] "*when the alerts go off, there is a sense of anticipation, excitement - all of that -and I think it's because I know that I'm gonna test myself. I'm trained to do a certain job and although it's not good news for some people, it's, we're there to try and make a difference and I'm quite excited about the fact that I'm gonna go and do something and make a difference".* Another [882] firefighter agreed*, "yeah, I get really excited because I've trained hard, I work hard at my job, and I think I'm competent at it so when the bells go regardless of what I['m] faced with, I feel 'right, you know, this is good'".*

Laughing, one firefighter [3516] said : *" I've always felt in this job that, when people ring 999 it's a cry for help, it's a last resort and we will always turn up and we will do our best. A lot of the times people don't survive, but a lot of the times we help a lot of people, and so the good stuff that we do … maybe someone comes out the building or we put the fire out or we get people out of the crashed cars and they live and they go on and have a good life, that far outweighs the bad stuff when people are dead and stuff like that. So, my league table's in the positive at the moment".* Following this comment, unidentified firefighters in the background laughed and said *"And long may it continue"* and *"Over and out".*

Fires were particular sources of exhilaration. Smiling, one firefighter [1828] said **"***Just in general, yeah I still get a kick out of it".* He described what he loved about fires: *" I like that turning up, flames coming out of a window, it going like a steam train, and that two three minutes of like I said what we call organized chaos".* Another [882] said *"If it's a house fire then I look forward to sort of like getting there and doing the, you know, going into a fire 'coz it's not something that we do every day".* This relative rarity of incidents was echoed by another firefighter [3878] who said *"incidents becoming few and far between these days so when you do get something to go to, you're a bit excited"* and by another [1828] *"but every time those bells go down, it's like 'yes'. I don't like kicking around the station twiddling my thumbs doing nothing, I wanna be out. If I had my way, we'd be to one incident, back for a cup of tea, twenty minutes later back out, back in cup of tea, back out and we'd be doing that all day long if I had my way".*

The last word goes to two firefighters who expressed their feelings for the best parts of their jobs with palpable enthusiasm. The first [882] said *"it's just that, sort of like, I dunno, the kid in me that likes driving a big red truck and I dunno I do get excited. I get excited for other people when people wave at you. I, you know, I really enjoy the job and that's why I do it like".* And the second [1828] laughing as he spoke, summed it all up thus: *"When people say what did I join for, it was to climb ladders and squirt water and kick in doors and it's that simple really. I wanted to be the all action hero for a want of a better [word], as stupid as that sounds. That's why I joined. And I think it's probably why every bloke joins and girl joins. It's like 'right, all I want is a set on my back, a jet in my hand, and I wanna get in there at the sharp end and do the business."*

This firefighter [1828] looked back wistfully on life before his promotion. He said, *"I'd have happily sat in the back and driven a fire engine for the rest of my life".*

7.4 Discussion

Three themes were developed in this study which relate to the objective severity of the incident; the elements of it which persisted in firefighters' minds through intrusions, and how these were dealt with; and the peri-incident and post-incident emotions experienced. A fuller discussion of this Chapter incorporating how it enriched data collected in studies 1 and 2, implications for theory, research and practice questions arising from it, is in Chapter 8. Here the major findings are summarized together with the strengths and limitations of this study.

7.4.1 Summary of major findings

The role and responsibility a senior fire officer takes where, rather than being concerned for himself, his concern is for his fellow men, can create dissonance, distress and feelings of guilt and helplessness through operational limitations is a marker for distress. Identification with the dying or dead victim can also create feelings of dissonance if a firefighter feels he has to choose between protecting his crew from distress whilst simultaneously expressing respect for the dead. Identification is a marker for personal distress because meaning has been attributed to the event through recognition of the deceased's humanity, such that avoidance tactics are used in an attempt to neutralize it. Thought suppression was rarely used as such a tactic, although attempts to suppress images were reported, not always successfully.

Less upward counterfactual thinking was reported than expected, and that which was related to decision making and operational difficulties, but downward counterfactuals and positive emotions were far more prevalent. Humour, in the form of banter including "taking the piss" out of colleagues and victims was widely reported, although not experienced the same way by all firefighters. Where humour was not reported, it is possible that firefighters had protected senior officers from its use because of their roles. Humour is used as a bonding mechanism, as a kind of emotional language and as a way of coping with the stressors inherent in the job of firefighting. One intriguing use of humour was as a method of transposing upsetting images into amusing ones, a variant of the mental transformation techniques noted in the literature before (Taylor & Frazer, 1982). Positive emotions, professional pride

and a strong sense of duty were expressed far more than “negative” emotions, suggesting a high degree of resilience.

7.4.2 Strengths and limitations

Lincoln & Guba (1985) established four criteria for establishing the trustworthiness of the findings in naturalistic inquiry: credibility; transferability; dependability and confirmability. According to Holt (1991), the first goes to whether the interpretation agrees with the participant’s opinion; the second as to whether the interpretation is generalizable given changes in context; the third as to whether the researcher is consistent; and the fourth as to whether the interpretation is “logical, non-prejudiced, nonjudgmental, supportable by data” (p. 57). This approach has been criticised. Holt (1991) states that it “does not necessarily lead to more trustworthy research and thus they should not be used as criteria for evaluation” (p. 61). He believes instead that interpretations should be judged on their “insightfulness” and “ability to convince the reader, no more” (p. 61).

Hoepfl (1997, Addressing trustworthiness in qualitative research section, para. 2) cites Smith & Heshusius (1986) as being “particularly incensed” by Lincoln & Guba’s (1985) comparisons between their trustworthiness criteria for qualitative research and those used for quantitative. Notwithstanding the criticisms of the criteria, these are now addressed.

Credibility is compared with internal validity in quantitative research, and Hoepfl (1997) cites Patton (1990) as stating that it depends on the data and the researcher’s ability to analyse those data. Triangulation methods can enhance credibility and, according to Lincoln and Guba, 1985, pp. 313-316), include checks in which respondents corroborate findings (Hoepfl, 1997). The credibility of the present findings is enhanced by the researcher’s previous experience of collecting data through interviews. The structure of the interviews/focus groups in this case was designed to provide minimal questioning and free responses from participants which were then accurately described and compared with existing literature for analytical purposes. The findings replicate and/or extend such literature. Checks were conducted by the Facilitating Fire Officer, who did not take part in the study and was not present at the interviews/focus groups, but was familiar with the critical incident studied.

Transferability echoes external validity, but it is accepted that it is for the reader to decide the extent to which the findings generalise to other contexts, and is something which the researcher cannot do

(Hoepfl, 1997; Lincoln & Guba, 1985). The transferability of the findings in this study is for the reader to assess, perhaps particularly so given the relatively unusual nature of the incident studied. It is not, however, so unusual as to be outside the realm of usual firefighter response such that elements of it will be seen in other critical incidents and have been reported in the literature. It can be seen from the findings that participants themselves described it as just another job.

Dependability is comparable with reliability, but Hoepfl (1997) cites Lincoln & Guba (1985) thus: "Since there can be no validity without reliability (and thus no credibility without dependability), a demonstration of the former is sufficient to establish the latter" (p. 316). This may be improved by a consistency assessment of the process and the product (Hopefl, 1997; Lincoln & Guba, 1985). Having demonstrated the credibility of the findings in this study, their dependability should also be demonstrated and the research methods used for data collection and analysis are given here.

Confirmability is comparable with objectivity. Hoepfl (1997) states that “A researcher who is neutral tries to be non-judgmental, and strives to report what is found in a balanced way”. Lincoln & Guba (1985), as cited by Hoepfl (1997), speak of an audit trail through which the process can be followed. Hoepfl also cites Phillips (1990) in questioning whether there is a substantial difference between quantitative and qualitative research and that, where the work in either research domain is good, it will have been opened up to criticism and scrutiny, and thus will be objective.

Confirmability (or objectivity) is demonstrated in the present study by the neutrality of the researcher’s approach. Her background in aviation disaster litigation, with a particular interest in the handling of human remains, opens up the question of potential bias as to her motivation for carrying out the research. She was drawn to explore first responders’ experiences because of her exposure to the recollections of those who had been involved in responding to aviation disasters. At the outset of the research programme, she held the view that the handling of the dead was an event likely to lead to suffering, including PTSD, given the literature of which she was aware at the time and her conversations with those who had experience of such stressors. To this extent, it could be said that she had a “pro-PTSD” bias. However, the literature review for this research project revealed inconsistent findings and her studies on the development of PTSD as a disorder created further doubt. Further, by the time of study 2, she had already carried out data collection for study 1 and was by then well aware of the high use of humour on the mess deck. Thus, she was open to the possibility that the participants would be

either resilient to the stressors involved in the critical incident or that they might have succeeded in piercing participants' resilient shield.

As expected, this study provided data which enriched that collected in study 2 regarding the CI. Those firefighters who volunteered to take part were able to choose whether to be interviewed alone or in groups, which provided a level of comfort. Even many of those who chose not to speak individually on record about their experiences indicated when they agreed or disagreed with the speaker. It therefore seems unlikely that the firefighters felt inhibited from speech or less inclined to air their honest views. Indeed, the interviews informal, relaxed and suffused with banter and laughter. There was no time limit given for the interviews so participants were able to talk as much or as little as they wished. The level of detail provided exceeded that available in quantitative research, permitting greater understanding of participants' experience of the study incident and its aftermath, and revealing the factors which appear to underlie their resilience to this critical incident exposure.

The study was small in size, as was necessitated by the number of firefighters responding to the CI. Ideally, perhaps, the interviews might have taken place shortly after the CI in order to capture the emotions closer to the time they were experienced. However, this would have been highly intrusive and possibly counterproductive, and the fact that it had been successfully integrated into their overall experience as firefighters was a valuable indicator of their resilience. Further, although the timing of the qualitative study in taking place after T1 but before T2 of the longitudinal study may have adversely affected the number of participants willing to take part at T2, this seems unlikely. Because participants in the qualitative study were not under any pressure either to participate or to speak if they did participate, and because those who spoke did so equally freely, it stands separately from the subsequent data collection at T2. At this point, it seems that the incident had been integrated into the past such that there was less desire to return to it, and that the lower participant numbers reflected this.

Personal statement

One aspect of the interviews and focus groups which deserves comment for the benefit of future researchers is the emotional impact it had upon me, as the researcher. For approximately two weeks afterwards, I was haunted by intrusive thoughts and images of the participants. I saw their faces and heard their voices and they moved me to tears. It seems that this was the point when it really struck me

that this was what it meant to be a firefighter: what these men did, they did for another human being. The arrow which pierced my own shield turned out to be the dignity, courage and honesty with which they described their efforts, in such harrowing circumstances, to save another man's life, and, when that proved impossible, respectfully to recover his body.

Although arrangements had been put in place for me to obtain psychological support in the aftermath, I did not feel able to access it because I felt bound to observe strict confidentiality as to the details of the incident. May I recommend that researchers should be aware of the impact that undertaking qualitative research may have on them and ensure that they have arrangements in place which they can utilise should they become distressed. It may be of some comfort to know that, after a while, the intrusions faded, but the memory of these participants stays with me still, for which I am honoured and grateful.

7.4.3 Conclusion

The objectively horrific nature of the CI would be expected to evoke feelings of distress in almost anyone, and it appears to have done so, as manifested by the looks on the firefighters' faces at the scene and on their return. Even if distress was caused at the time, it was relatively transient in most firefighters, but not in all. Although many reported thoughts or images of the CI, usually cued by external triggers, there were feelings of helplessness and horror and disturbed sleep, these diminished over time. The greatest anguish appeared to arise on behalf of each other, demonstrating the strength of the professional bond between these men.

By the time of the interviews, the CI had been consigned to the past as far as these firefighters were concerned, and they did not want to spend more time thinking or talking about it. Faced with a horrific incident with little available guidance as to how it should be handled; unusual elements for which they had not been trained; difficult decision making; and strong emotional responses, they were remarkably resilient. The bonds which exist in this second family for firefighters are powerful, developed through a sense of duty and professional pride; strong *esprit de corps;* openness to emotion of leaders; and, a shared private language of humour which together perhaps ultimately prevail over regret, guilt and helplessness.

The words of one firefighter [3516] express this sense of duty and professional pride with such raw simplicity that they deserve repeating: *"I've always felt in this job that, when people ring 999 it's a cry for help, it's a last resort and we will always turn up and we will do our best. A lot of the times people don't survive, but a lot of the times we help a lot of people, and so the good stuff that we do … maybe*

someone comes out the building or we put the fire out or we get people out of the crashed cars and they live and they go on and have a good life, that far outweighs the bad stuff when people are dead and stuff like that. So, my league table's in the positive at the moment". Following this comment, unidentified firefighters in the background laughed, saying: "*And long may it continue*", and then, rather aptly, one said: *"Over and out".*

Chapter 8 : Discussion

8.0 Introduction

This chapter commences with a restatement of the rationale behind the studies. It is then structured such that the results of the studies undertaken are discussed first in the context of prevalence of symptomatology of PTSD, depression, anxiety and alcohol misuse. Results relating to multiple exposure and single critical incident exposure are compared. Next, the three cognitive predictors of such symptomatology, the focus of these studies, are discussed with counterfactual thinking and thought control taken together and followed by humour style.

Following the cognitive predictors, this chapter discusses other predictors of PTSD, depression, anxiety and alcohol misuse dividing them into demographical, Criterion A1 exposure, intrusive thoughts, and A2 and other "negative" emotions. Finally, the implications of the results for theory, future research and practice are discussed.

8.1 The main findings in response to the rationale for this study

As reviewed in chapter 2, firefighters were chosen for study because they have one of the most dangerous civilian careers (Farnsworth & Sewell, 2011) and are subjected to a wide range of stressors capable of satisfying Criterion A1 of DSM-IV which may lead to PTSD (Carlier & Gersons, 1994; Marmar et al., 1996; Weiss et al., 1995; Lindahl, 2004; Del Ben et al., 2006). There is evidence that firefighters may be generally resilient to adverse after-effects of chronic, multiple exposure (Kalimo et al., 1980; Harris, Baloğlu & Stacks, 2002; Wagner, McFee & Martin, 2009; Meyer et al., 2012; Del Ben et al., 2006; Meyer et al., 2012; Lee et al., 2014). However, the risks of developing post-exposure symptomatology seem to be complex and intertwined (Corneil et al., 1999; Dean, Gow & Shakespeare-Finch, 2003; Cook & Mitchell, 2013).

A three stage investigation was conducted with UK firefighters with a range of exposure to PTEs to investigate the prevalence of symptomatology of PTSD, and, because of comorbidity, depression, GAD and alcohol misuse. The primary focus was thereafter to examine whether three cognitive processes were predictive of resilience or vulnerability to exposure by reference to symptomatology recorded. These processes were thought control, counterfactual thinking and use of humour.

Taken together, the results of the studies reveal that these UK firefighters showed resilience to the development of symptomatology in four domains, but that some characteristics of their occupation are psychonoxious. In these studies, no attempt was made to "diagnose" the four conditions, nor could there have been in the absence of validated clinical interviews. The conventional approach was adopted of describing prevalence rates of PTSD, depression, anxiety and alcohol misuse using validated cut-off points for the respective instruments measuring symptomatology. Although cumbersome, the diagnostic label in isolation was avoided wherever possible and replaced by "symptomatology" of each condition, in an endeavour to reflect the importance of the controversies, the potentially stigmatizing impact of affording a label to participants, and the fact that no formal diagnosis was attempted. The prevalence rates thus indicate that a specified degree of symptomatology has been recorded, and could perhaps best be viewed as markers of the higher end on a spectrum of suffering.

Simultaneous investigation of these cognitive predictors and comparison of the use of humour style in and outside of work extends the literature, demonstrating that they possess both psychonoxious and healthy aspects. Nonreferent upward counterfactual thinking and self-defeating humour uniquely and independently predicted higher symptomatology of PTSD, and self-enhancing humour similarly predicted lower symptomatology of depression. The potential existence of a humour style described as "banter" and the development of "rules of banter" was achieved through the qualitative study, and contributes to the literature with particular relevance to firefighter humour and the implications of its use.

Pre-trauma and peri-trauma characteristics were also predictive, and exposure to the dying and dead is a potential marker for distress.

These findings suggest that there are domains in which opportunities exist to help safeguard firefighters from potentially adverse consequences of their work, which are discussed at 8.6 below.

8.2 Symptomatology of PTSD, depression, anxiety and alcohol misuse

8.2.1 Multiple exposure: cross sectional Study 1

The rate of PTSD at 5.3% is within the range of prevalence at the lower end of reported firefighter studies, being less than 8% (Del Ben et al., 2006; Chen, 2007; Chiu et al., 2011; Nydegger, Nydegger & Basile, 2011; Haslam & Mallon, 2003; Morren et al., 2005; Meyer et al., 2012)

Moderate to severe depression symptomatology was found at 3.29%, directly comparable to US firefighters at 3.5% (Meyer et al., 2012) and GAD symptomatology was found at 8.6% as compared to 4.2% in US firefighters, although instruments and methodology prevent direct comparison.

Rates of probable alcohol misuse (CAGE ≥ 2) were reported by 17.7% of participants in this study, while rates of possible misuse (CAGE ≥ 1) were found in 24.8% of the sample. These rates are similar to those found in the UK general population of 24.3% for hazardous drinking and are comparable with American firefighters' past 12 month probable abuse at 10.6% and possible abuse at 22.5% with lifetime probable misuse observed in 25.4% of participants and lifetime possible abuse in 40.1% (Meyer et al., 2012).

Thus, this study partially replicated and extended that of Meyer et al., (2012) in suggesting that UK firefighters are relatively resilient to the development of PTSD given high exposure at a level comparable with US firefighters and to US community samples (Kessler et al., 2005); and to the development of depression and anxiety symptomatology comparable with US firefighters. Higher rates of anxiety symptomatology in UK than US firefighters may reflect the use of different instruments and the absence in the US study of two variables predictive of anxiety in this study. Risks of developing lifetime probable alcohol misuse were comparable with US firefighters (Meyer et al., 2012).

8.2.2 Single critical incident exposure: Study 2

Although the percentage prevalence rates of PTSD were higher at both points in Study 2 than in Study 1 (9% and 14.3%), they still fall within the range reported according to Meyer et al., (2012) for firefighters from approximately 4-13% (Del Ben et al., 2006; Haslam & Mallon, 2003; North et al., 2002a; 2002b), and prevalence rates have been found at even higher levels (Corneil et al., 1999; Bryant & Harvey, 1996; Alghamd, Hunt & Thomas, 2013). Further, at both T1 and T2, they apply to 2/23 firefighters.

Symptomatology of severe depression (0% and 14.3%); severe anxiety (0% and 15.38%); probable alcohol misuse (4% and 14.3%) and possible alcohol abuse (9% and 7.1%) increased (on the whole) over the course of Study 2, but in terms of numbers of firefighters affected, only for a small number. Alcohol abuse declined at T2.

8.3 Cognitive predictors

8.3.1 Variance in symptomatology

Overall, the predictors studied accounted for 39 - 44% of variance in symptomatology of PTSD, depression, anxiety and alcohol misuse in study 1, which are large effect sizes, illustrating the validity of the inclusion of the three psychological, cognitive constructs in a combination not previously tested.

For PTSD symptomatology (44% of variance), no demographic or exposure variable accounted for significant variance, except for previous divorce. As expected, higher A2 responses were significant predictors, but only fear with HSQ entered and helplessness with HSQX uniquely so. Over and above these variables, psychological variables accounted for 17% of variance in PTSD, with nonreferent upward counterfactual thinking and self-defeating humour making unique contributions, both when humour was used at work and when used with the person closest to the participant.

For depression symptomatology (39% of variance), operating as “day crew” significantly predicted higher depression. The psychological variables accounted for 17% of variance, with self enhancing humour uniquely predicting lower symptomatology in both models.

For anxiety (40% of variance), operating as day crew and attendance at incidents in which persons were trapped (excluding fires or RTCs) uniquely predicted higher symptomatology. No other variables emerged as predictive, and the results were essentially the same in both humour models.

For alcohol misuse (40%), previous divorce and psychiatric diagnosis predicted alcohol misuse individually and exposure variables contributed significantly (10%) with attendance at RTCs an independent predictor. No other variables emerged as predictive, and the results were essentially the same in both humour models.

Thus, of the three cognitive predictors, nonreferent upward counterfactual thinking and self-defeating humour predicted greater PTSD symptomatology and self-enhancing humour predicted less depression symptomatology.

8.3.2 Counterfactual thinking and thought control as predictors of psychopathology

These two cognitive predictors are considered together, as it has been suggested that they may be intertwined (El Leithy, Brown & Robbins (2006). In Study 1, on correlational analysis, significant relationships were found between thought control and each of the four sets of symptoms, and contributed to the variance on regression, but, unexpectedly provided no unique contribution as a

predictor to PTSD. Thought suppression has been linked with psychological distress, although inconsistently, as was discussed in chapter 3. Upon investigation of thought suppression in Study 2 concerning one CI, a relationship was revealed between PTSD symptomatology and thought suppression at T1. However, qualitative data collected at the same time in Study 3 suggested that, if disturbed by intrusive thoughts, the firefighters did not generally appear to attempt to suppress them, and by T2, no relationship subsisted. Taken together, the results of the three studies indicate that thought suppression is correlated with PTSD symptomatology in firefighters over a range of exposure and period of time and that it those who engage in though suppression were more likely to suffer symptomatology approximately six months after all participants had been exposed to the same event; but not in the longer term. The fact that interview participants did not emphasise attempts to suppress thoughts on interview may be explained by their recollection of a commonly transient experience of intrusions regarding the incident, suggesting that they felt no need to suppress thoughts. Alternatively, they may not have viewed their attempts to distance themselves from the characteristics of the incident as suppression, whether they had done so through avoidance of the reality of what they saw in actuality, or through neutralisation with humour.

Both self-referent upward and nonreferent upward counterfactuals showed strong correlational relationships with PTSD symptomatology and with greater alcohol misuse, but only nonreferent upward survived the multiple regression, and only in regard to PTSD. In the absence of a large body of literature in traumatology (Dalgleish, 2004), no firm hypotheses were generated in terms of the focus of upward counterfactuals and PTSD symptomatology, although it seemed likely that firefighters might succumb to such cognitions in circumstances where rescue or recovery had not been possible. No counterfactual was related to more symptomatology of depression and anxiety, which was mildly surprising because they have been previously associated with distress, as reviewed in Chapter 3.

In Study 1, nonreferent upward counterfactual thinking independently predicted PTSD symptomatology supporting previous findings that these are associated with PTSD in an unspecified direction as reviewed in chapter 3. In Study 2, those who engaged in counterfactual thinking denoted as “if only” cognitions were more likely to have PTSD symptomatology at T1, but not at T2. This suggests either that although upward counterfactuals were maladaptive in the short term they were not in the longer term, or that over time, firefighters ceased thinking in this way about the CI. Against expectation, in Study 3, upward counterfactual thinking and expressions of regret were relatively uncommon with these firefighters in relation to the CI. Because the victim had died at the scene, it had been anticipated that there would be

self-referent upward counterfactuals expressed, but it seems that they recognised that saving him was unrealistic given the gravity of the injuries sustained.

Decision making appeared to be a marker for self-referent counterfactual thinking. This "if only" thinking did occur for one firefighter who thought he should have kept those firefighters outside the incident more closely informed as to what was going on to make them feel part of the end result. Similarly, one firefighter struggled later with his decision not to cover the head of the victim, torn between trying to protect his men (through de-identification with the victim) and his eventual rationale that, by not covering him, "I was trying to show that person, even though they're dead, some sort of [respect] in my own little world". He subsequently wondered if this desire was misplaced and that he should have been looking out more for the firefighters. This reflects the universal respect for the dead which necessitates their transformation from the dead back to a person (Blanshan & Quarantelli, 1979). Other firefighters have struggled with this when having to leave bodies in situ overnight, covered with blankets on the runway and grass borders, following the crash of a United Airlines DC-10 at Sioux City, Iowa (Fullerton et al., 1992). These firefighters showed anger and distress at the perceived disrespect for the dead.

These expressions of guilt show the downside of compassion as the firefighters concerned were struggling with dissonance (Festinger, 1957) either for the victim simultaneously with the responding firefighters, or with the firefighters' feelings and the roles they are required to take. Feelings of guilt associated with such decision making were experienced. One felt guilty over ordering his crew to administer oxygen to the casualty in the absence at the time of an ambulance crew, wondering whether he should have asked them to do so. He was somewhat reassured by the crew subsequently who saw it as their job. Another, one of two firefighters who had agreed on a decision as to who should take a specific role, felt guilt that he "didn't step up the mark", but ultimately felt they had done a "fantastic job with the circumstances that we were given". The other engaged in similar downward counterfactual thinking.

The majority of upward counterfactuals were non-referent, expressed as wishing the incident had never happened or that the firefighters had not been on duty. One example of other referent upward was given in terms of the part the victim had played in the incident, but most were in relation to lack of support or procedures to deal with an incident such as this, very unusual, one. Because of this, a feeling

was expressed that, if a similar incident happened again, he thought they may find themselves in the same situation, which perhaps displays a certain degree of hopelessness.

Although firefighters agreed that they looked back on jobs and asked themselves whether they've done the best they could, they recognised that sometimes they experienced "if only" thoughts but that these can cause problems when starting to think "oh actually, we should have done that, should have done this if I'd only done that". Expressions of downward counterfactuals were, however, almost universal with a strong sense of duty and professional pride exhibited in performing their roles, particularly in the unusual circumstances. That time appears to providing some healing is demonstrated by the irritation firefighters felt by the time of the interviews at having to go over the incident again and that they had become sick of talking about it. The consensus seemed to be that the CI was just another job, which is not heartless, but pragmatic, and possibly a sign of peaceful integration of potentially traumatic experiences.

It is interesting, however, that, unknown to the interviewer at the time of the interviews, the results of Study 2 had revealed a relationship between upward counterfactual thinking and symptomatology of PTSD.

8.3.3 Humour style as a predictor of symptomatology

It had been anticipated that humour styles may be used differently at work and with loved ones outside the fire service, primarily because the humour used by first responders tends to be confined to the workplace (see further below). For this reason, the HSQX was developed for Study 1, investigating firefighters' use of humour with the person closest to them outside work, "X". However, although there were some differences in results, those factors which independently predicted symptomatology were essentially the same, although three differences emerged. Firstly, A2 responses differed in that intense fear predicted posttraumatic symptomatology only in the HSQ model whereas both fear and helplessness did so in the HSQX model. Secondly, non-occupational fear predicted alcohol misuse only in the HSQ model. Finally, a serious injury caused to a colleague in the incident remembered well predicted depression in the HSQX but not in the HSQ model. The fact that both similarities and differences were observed between the two models justifies the use of the HQX in addition to the HSQ, and is particularly informative with regard to the cognitive predictors.

In Study 1, all humour styles contributed to the variance in symptomatology, with self-enhancing humour and self-defeating humour emerging as independent, unique predictors of lower depression

symptomatology and higher PTSD symptomatology respectively. Further exploration of humour styles in Study 3 revealed that firefighter humour may be most accurately described as "banter", the use of which is associated with unwritten rules, and which appears to contain elements of HSQ styles dependent upon how it is used and how it is viewed. Alternatively, banter may itself be a style of humour. Thus, banter is discussed first, followed by an analysis of results relating to HSQ styles.

Banter

Banter is endemic in firefighters and it appears to take two forms. The first involves "taking the piss" out of one another and the second "taking the piss" out of the situations they encounter, in the form of black humour, which "juxtaposes morbid or ghastly elements with comical ones that underscore the senselessness or futility of life" (The Encyclopaedia Britannica).

As one firefighter put it: "Banter is used all the time in terms of piss taking which is part of their normality, as with most uniformed jobs, and appears to reinforce a sense of belonging to the group. It's recognised as not being acceptable to receive from or impose on outsiders. It's so normal that it can almost become compulsive, so that they literally cannot stop themselves from doing it" (personal communication 10.12.14). On interview, another said "… it's like an experience they've shared so they then put it into their own terminology, their sort of lingo". He went on to say that it works ''… to protect others as well from being able to understand what they're going on about as well''.

The rules of banter

But banter has rules, the first being that it is reciprocal, explained by one firefighter in a personal communication [06.3.15] in that if a firefighter "takes the piss" out of others, but cannot take it himself, he is seen as a one-handed butler as it is "expected that what they gave out they would get right back" (Vivona, 2014, p. 135). One firefighter at interview reported that the "lovey dovey and cuddly" support he had received early in his career had not worked for him, but as soon as someone started "taking the piss" out of him, he found it worked. Crime scene investigators have also reported this: "If they are busting your chops… they are giving you grief because they like you. In our culture, if they are not giving you grief it's a problem" (Vivona, 2014, p. 135).

The second rule is that the timing of humour is critical. One firefighter stressed that he had never seen anyone "taking the piss" during a job, a comment with which all other respondents agreed. Rather, the moment they finished the job was the point at which the humour generally began, supporting Alexander & Wells (1991) that the context of a joke is critical. Another explained how, although he has the image –

and the smell – of the critical incident with him still, he can now laugh about it because, hours after it, he gave another firefighter a nickname reflecting that firefighter's role in the incident. Although that firefighter thought it a little too soon to start giving out nicknames, the one who had done it thought for a moment and then carried on. This is so not merely for the bestowing of nicknames on each other, but also for the nature of the jokes which arise, and which are macabre, or black, in nature.

There was agreement that, as with all incidents, no humour was used during the response itself, because, as one reported, firefighters have a role, professional pride and are focused on concentrating on doing the job well. Two firefighters reported it starting shortly thereafter. One said "immediately after the incident had closed and we withdrew from the risk area, humour was used within our group", and another that humour begins "almost as soon as you're moving away and the stress levels start to come down". For another, it was not until about a week after the CI that he was aware of the first "funny" being cracked about it and, whilst he found it "distasteful", he accepted that it was just how they deal with things.

But the rules of timing also apply to the length of time for which such humour is used. One described it as ceasing to be positive, but becoming negative with which others agreed. It seems that insofar as the firefighters' use of humour is a coping mechanism for them as a group, it seems to be required only for a period of time. The firefighters intuitively know when the humour has served its purpose, and the decreasing need for it reflects repositioning of the incident into the past.

The third rule of banter is that there are contextual restrictions on its use. First, there are some occasions in which it is never used. This is notably so in the case of victims who are children or fellow officers. But it may have affected the different experiences of firefighters in the critical incident response, probably because of its severity. One said that the use of humour was exactly the same as in other incidents, even though this one was very unusual. He reasoned that "it makes it something more normal if we react to it in the same way and, if we reacted differently, then it might escalate in our minds to the severity of it and probably make it worse for us psychologically".

On the other hand, one firefighter said that, as far as he knew, no humour was ever used in relation to the CI "either with the crews, myself or any other individual because of the severity of it" and that it was probably the first incident he had witnessed in which humour was not used. Another said that, also for the first time in his career, he did not want to come to work because he was just not in the mood for jokes, but he found the watch "looking quite so solemn really around the table and they'd had a day of it

and they'd been through it all that day and they weren't, there wasn't any funnies". He breathed a sigh of relief, "because they all probably felt the same as I did or worse, I don't know, but they, no-one was in a mood to joke about it that following day". Perhaps it was the unusually disturbing manner of dying which had visibly affected the firefighters or that those who did use humour protected their senior officers from it, suggesting both that the importance of language in context is intuitively understood, and that the bond between these men is strong.

The second contextual aspect of this rule is that firefighter humour, particularly when it is black in nature, is a private language, as the literature reviewed in chapter 2 showed. This has a protective function for the firefighters themselves despite "political correctness", and perhaps for those outside the Service. As one firefighter put it, they "put it into their own terminology, their own sort of lingo, to protect others as well from being able to understanding what they're going on about". The firefighters do not use it "as a mean and demeaning way upon the casualty".

There may be a fourth rule of banter, as discussed in the review at chapter 3, which is that, being healthy and therapeutic, its absence may be a sign of an overwhelming emotional burden (Vivona, 2014). There was no specific comment made to this effect in interviews, but humour's use as an effective coping mechanism was widely agreed upon. It seems possible, however, that the absence of humour may indicate cause for concern: "if a senior officer had not noticed any banter relating to a particular incident and it had been a particularly unpleasant one, or one of a sensitive nature [he] may have to consider that the firefighters may feel unable to talk about it and [he] would have to make delicate enquiries as to their wellbeing" (personal communication with firefighter, 06.03.15).

Purpose and effect of banter between firefighters

As one firefighter put it, ''you do become a second family and humour is always gonna be part of that'', supporting Corneil et al., (1999, p.139) in that the organization is a "social network [which] might be compared with a family or kin system". With such a strong *esprit de corps* (Aveline & Fowlie, 1987) firefighters described humour as breaking down barriers, building bonds and bringing the watch or crew closer together, and that it is probably the easiest way collectively to cope. Thus it may facilitate social exchange (Gelkopf et al., 2006) and foster positive social support (Fullerton et al., 1992), which is associated with resilience (Brewin et al., 2000; Ozer et al., 2003).

In addition to bonding, humour helps firefighters to defuse the impact of the stressors they face. Firefighters used expressions such as "lightens the air, relaxes people" helping them to "chill out" or

calms the air" and to "help break tension. One remarked that "it sort of snaps you out of feeling so serious and it … relaxes you so it's like a self-defence mechanism really". Firefighters used words such as "distracting" and "detaching" to describe the effect of humour, and it seems that it constitutes neutralization through reappraisal of a stressor already designated as stressful (Kuiper, Martin & Olinger, 1993; Sliter, Kale & Yuan, 2013). One said "I'd say humour ultimately is used a lot of the time in most jobs good, bad, ultimately a lot of the time. It's, I would suggest, it's used to actually distance yourself from reality from what the actual jobs are." It is in this context that, alongside the attribution of nicknames and interpersonal humour, macabre or black humour emerges, although as this humour is shared amongst them, it also constitutes a form of banter.

All firefighters in one interview group agreed with one who offered that humour puts "the pictures that we have of the incident turned into a more humorous way so that we can actually deal with it in our own little ways", literally transposing negative images into positive ones. This helps, according to another, to "erase some of those feelings, some of the things you actually picture and you got in your mind, albeit some of those pictures don't go, but it does help". This provides intriguing support for the finding that first responders spontaneously and visually transposed humans into objects (Taylor & Frazer, 1982) although doing so by the use of humour, and supports Janoff (1974) that the purpose of black humour in the face of death or dying is to neutralise its emotional impact.

However the mechanism operates, firefighter humour is used in this context as a distancing tool (May, 1953) used to minimize negative affect, as reviewed in chapter 3. Notably, the firefighter participants were united in stressing that it was not meant in any way to be demeaning towards the victim, but rather a release for themselves. The results confirmed that banter, particularly when it is black humour, is a language which works, as does medical slang, by "creating a sense of belonging, a unique identity and a private means of communication" (Moran & Massam, 1997, p.4); and that it is a private language confined to the work domain (McCaroll et al., 1993; Alexander & Wells, 1991; Barnes, 1999). It emerged that humour may be seen as a more acceptable emotion to express than others, supporting Wanzer, Booth-Butterfield, & Booth-Butterfield (1996) in that it may make people more likeable. A theory of the mechanisms by which banter may operate within a humour style model in the context of PTSD is advanced below.

Self-enhancing humour

Self-enhancing humour emerged as being independently predictive of lower levels of depression, supporting previous studies (see review in chapter 3). This finding is supportive of the supposition that

self-enhancing humour is most closely related to humour as a coping mechanism (Martin et al., 2003) and may be the healthiest style (Martin et al., 2003; Martin, 2007).

The finding that the benefit of self enhancing humour prevails whether the firefighter is at work or with a loved one is consistent with having a generally humorous outlook on life. It may be that banter emerges from possession of this outlook, in that it signifies a method of expression rather than a separate style of humour. At work, banter may be used to express this generally humorous outlook because that is the language of the fire service, but with a loved one, self-enhancing humour may be expressed in a different way.

Self-defeating humour

Characterised as self-disparaging and ingratiating through amusing others at one's own expense, or using it to hide real feelings, self-defeating humour has clear negative connotations.

Somewhat surprisingly, no relationship was found between this style of humour and depression or anxiety, in contrast to previous research reviewed in chapter 3. Relationships between humour styles and PTSD have not previously been investigated. The novel finding that self-defeating humour did independently predict PTSD symptomatology both when used at work and with a loved one at the same level of significance thus extends the literature showing poor mental health outcomes in general. A theory for this predictive power is advanced below.

Affiliative, aggressive and black humour

Contrary to expectation, given associations previously reported between affiliative humour and anxiety/depression (see chapter 3), this style did not survive multiple regression.

Because firefighters have such a strong *esprit de corps* and because affiliative humour "presumably enhances interpersonal cohesiveness" (Martin, 2007, p. 211), it had been expected that there would have been a stronger relationship between this style and use at work in terms of both anxiety and depression symptomatology. Instead, the affiliative style was correlated with lower anxiety only when used with a loved one, not with depression, and did not independently predict symptomatology of any of the four conditions studied. Martin et al., (2003) included banter in their description of the affiliative style, but if it is captured within that style, it is not independently predictive of any symptomatology. It had been speculated that aggressive humour might more accurately describe some elements of firefighter banter such as "sarcasm, teasing, ridicule, derision, or disparagement" (Martin, 2007, p. 211),

but it did not emerge as being related to any of the conditions under investigation. This suggests that, even if firefighter humour is, or becomes aggressive, it does not have a detrimental effect on mental health.

Black humour returned no relationships with any form of symptomatology. Possible explanations for this are advanced below.

8.3.4 Development of the sense of humour

It seems doubtful that the firefighters all happen to have the same "sense" of humour, but rather more likely that they learn this language, as cited by Moran (1998), through it being "passed on like a trait" from more experienced first responders to inexperienced ones (Rosenberg, 1991).

This is supported by firefighters' observations that this use of humour develops over time; on recruitment they are slightly shocked by it, but they learn either to tolerate it or to use it themselves. As one said of his experience at the outset of his career, when other firefighters were saying things about different jobs he thought "there's something wrong with all these people". He wondered whether he could "really make light of someone else's misfortune?" but, he went on to say, "I have grown into that person". However, although he would have a laugh, he would not take the lead, but neither would he take offence and he would go along with the humour, seeing the funny side of it.

8.4 Other predictors of symptomatology

8.4.1 Demographics

The only demographic variable uniquely predicting PTSD was a previous divorce. Previous studies have produced inconsistent results on associations between marital status and psychopathology, as reviewed in chapter 2. Previous divorce also independently predicted alcohol misuse, but negatively, a finding that begs more questions than it answers. Virtually all studies have found a relationship between drinking alcohol and marital status but have not consistently agreed on the direction of this relationship (Osterman, Sloan & Taylor, 2005). Since no significant relationships were found between current marital status and PTSD/alcohol use, it may be that the end of a troubled relationship may lessen the perceived necessity of using alcohol as a coping mechanism. A previous psychiatric diagnosis independently predicted increased misuse of alcohol, partially supporting Kessler et al., (1995) in finding that alcohol misuse was often related to other disorders and was usually secondary in time, but that that a previous psychiatric disorder was a generally stronger predictor of alcohol dependency rather than abuse.

Firefighter type uniquely and independently predicted greater anxiety and depression symptomatology with both usages of humour entered into the regression model. A possible explanation for the apparent greater vulnerability of "day crew" to depression and anxiety may lie in the lifestyle this creates, since they remain in close physical proximity to it at all times. Being exposed to visual and aural reminders of call-outs may result in not being able to distance oneself psychologically from the place of work and thereby cause emotional distress.

8.4.2 Criterion A1 exposure variables

Multiple exposure

In common with previous studies (see review in chapter 2), no Criterion A1 variable predicted PTSD on regression. Attending incidents with persons trapped in situations other than fires or road traffic collisions significantly and independently predicted anxiety symptomatology. This is perhaps explicable by the relative rarity of such events which means that there is less training and less practice for handling them, potentially cause anxiety.

Attendance at road traffic collisions independently predicted alcohol misuse. RTCs have been rated by firefighters as stressful (e.g. Jacobsson et al., 2014), but it is not entirely clear why that should be. A personal communication with a fire officer (9.10.13) suggests an explanation for this result. Approximately ten times more fatalities occur in RTCs than in fires, and a correspondingly higher number of injuries sustained. In fires, people are frequently killed by the effects of smoke inhalation and do not necessarily shown signs of any physical trauma, whereas in RTCs, firefighters are dealing with live casualties in great distress, sometimes trapped, who may die in view of numerous crew members surrounding the vehicle. The bodies of those who die in RTCs tend to be more physically damaged. Perhaps the chosen coping mechanism for some firefighters with high exposure to RTCs is self-medication.

Single critical incident exposure in Studies 2 and 3

As expected, the results demonstrated the inability of the term "severity" adequately to describe the experience of a CI for all those involved, and therefore its capacity to be psychonoxious (Alexander & Klein, 2001) through piercing the firefighters' resilient shield (Turnbull, 2011). Instead, it was clear that firefighters' responses to an objectively severe A1 event were not uniform. Some assigned high severity ratings to it because of the effect on the Fire Service; particular roles undertaken which were harrowing; the feeling of helplessness because the casualty could not be saved; apprehension for the body recovery

crew as to what they were to be faced with; and the nature and extent of the injuries sustained by the casualty which led to his death.

But not all firefighters agreed. For some, the injuries sustained did not make it the most dramatic incident, and in one case, the fact that they were so severe made it less stressful. But proximity was a factor, with lower scores on the scale for those outside the immediate area. Proximity to the event increases the risk of exposure to the smells associated with an incident or disaster, and the effect of smell on rescue and response workers is well established (e.g. McCarroll et al., 1993). This effect was found, with many firefighters mentioning it and the failure of their masks to shield them entirely from the smell.

Body handling

Consistent with previous research (see chapter 2), associations were found between body handling and symptomatology of PTSD in the short, but not long term, despite the "unimaginable" way in which the casualty died. Higher symptoms of depression were found in those not involved in body recovery at T2, a finding not easily explicable on the basis of the literature discussed at chapter 2 which is confined to reactions which follow on from body recovery. Given that it is a perplexing finding with no known empirical evidence to support it, it seems likely that it arises as a result of the small sample size; or is a Type 1 error; or constitutes symptomatology which developed independently of exposure to the CI.

Some firefighters identified with the victim through personalization of the casualty, supporting previous studies, especially through the face, supporting studies reviewed in chapter 2 e.g. (McCarroll et al., 1993; Taylor & Frazer, 1982; Fullerton et al., 1992). This was explained by one firefighter as occurring because it is through the face that we tend to recognize people, and therefore, once it has been seen, "their personality and everything [are brought] into light". In particular, the eyes conveyed pain and a cry for help.

It seems to be this which creates a bond of compassion with the dead, but a bond which the firefighters attempt to deny, as one put it "you don't want to become attached to them, you don't want to get your focus took away from the job". Therefore, the firefighters have to create a distance between themselves and the dead (McCarroll et al., 1993), through trying to avoid seeing the face or looking in the eyes. If this was unavoidable, it was for some successfully put to the back of the mind, but for others it was an indelible image. Avoidance (Barnes, 1999) through spontaneously viewing the dead as objects (Taylor & Frazer, 1982) and avoiding the face (McCarroll et al., 1993) were all used by some of the firefighters. It

is possible that the type of cognitive distancing the firefighters used at the scene, and revealed in Study 3, either by reappraising the body as an object or neutralising its effect through humorous transposing of images of it, was effective in preventing long-term suffering, but this was not directly examined. Triggers for personalisation did not arise exclusively through contact with the victim, but through links to his identity or family (Ursano, McCarroll & Fullerton, 2007).

8.4.3 A2 and other "negative" emotions

Multiple exposure

The Criterion A2 subjective variables of intense fear and helplessness did explain variance. Intriguingly, although only fear predicted PTSD when the HSQ was entered into the model, both fear and helplessness did so with HSQX was entered. The power of the A2 response to predict PTSD is not settled, but this study supports Declercq et al., (2011) in finding that intense fear and helplessness contributed to PTSD, but not in finding the same effect for horror. To some degree, the point is now moot, as DSM-5 (APA, 2013) does not require the A2 response as part of the Criteria which transform a potentially traumatic A1 event into a traumatic event, although emotional responses are retained as Criterion D (negative alterations in cognitions and mood associated with traumatic events) but only as a "persistent negative emotional state", and the examples given do not include helplessness.

Leaving aside the DSM criteria, helplessness does, however, seem to be an important marker for suffering (see e.g. Alexander & Klein, 2001; Hill & Brunsden, 2009).

For non-occupational exposure, feeling fear was significantly related to alcohol misuse on correlational analysis and predicted it on multiple regression but only when the HSQ was entered. The size of relationship between fear and CAGE score was almost identical with the HSQ and the HSQX entered, suggesting that any statistical difference is marginal. The reasons why fear should be more related to alcohol misuse when experienced outside of work than during it can only be speculated. Perhaps the support of colleagues in dealing with CIs, the training and the familiarity of occupational exposure help the firefighters to cope with fear experienced, whereas without these, they resort to drinking. Alternatively, the result may simply not be robust.

Critical incident exposure.

Although fear was unsurprisingly not reported, horror was not as prevalent as expected, given the nature of the CI. However, it was described as "shocking" and the stress of it was visible in the firefighters' faces at the time. Helplessness was reported by one firefighter, which together with

feelings of guilt and the role he played, affected him to such an extent that he was brought to tears by the incident, a situation analogous to other UK firefighters whose helplessness and guilt arose because of operational factors beyond their control (Hill & Brunsden, 2009). Where situational factors limit their sense of control over an incident, firefighters seem to be at greater risk of posttraumatic stress (Bryant & Harvey, 1996), and helplessness is a marker for distress generally (Bryant & Harvey, 1996; Alexander & Klein; 2001; Declercq et al., 2011), though not necessarily at a psychopathological level (Haslam & Mallon, 2003).

It may be that helplessness is associated with the inability to save life because there is nothing that can be done and is a reflection of perceived inadequacy of resources despite the fact that no actual resources could have changed the situation.

Focus or concentration

Far more prevalent than A2 or other "negative" emotions were reports of focus or concentration. Some firefighters attributed this to the training and drilling they undergo, and some to their role and experience. There are several possibilities for this finding. Firstly, not all firefighters were involved in the body handling itself, although most were confronted with the accident scene, and proximity may be a significant factor, with physical distance contributing to the ability to focus. Secondly, emotional responses to the face were not uniform. This supports Mitani's (2008) observation that how firefighters experience an event varies with the individual, such that some firefighters were able to maintain focus despite the potential for personalization of the victim.

Positive emotions

Positive emotions in general were far more frequently expressed by these firefighters than were negative ones, so that relief, excitement, exhilaration and professional pride appeared to outweigh helplessness, guilt or regret for most of them. They were perfectly well aware that the expression of positive emotions could be construed adversely and strove to make it clear that they were not experienced without understanding the suffering of those to whom they were responding. In other words, they were able to improve a bad situation and they took pleasure and pride in this. This supports similar findings in first responders, as reviewed in chapter 2.

8.4.4. Intrusions

On the whole, intrusions reported were not long-lasting, some arising spontaneously, and some when cued by triggers. Images were experienced as transient and dreamlike by some, but for others, they were indelible. One experienced such images as thousands of mental photographs and videos through which he could flick through, and he deliberately tried to speed them up, but not always successfully. By the time of the interview, he was no longer experiencing uncued intrusions or difficulty in sleeping.

Images and thoughts were more commonly cued by external triggers than arising spontaneously. These included other people talking about the incident, the alarms going off at the station, and the arrival of the interviewer herself on the station. In one macabre example, a firefighter found that images were cued when he was asked by members of the public "What's the worst thing you've ever been to?" Some, but not all, found that one incident reminded them of another, which could happen when passing the scene of a previous accident.

Not all triggers were unwelcome: firefighters appeared to find the open discussion of the incident between themselves, which was by its nature a trigger, helpful. Further, the empathetic response of one of the officers provided great comfort to a firefighter distressed by the experience. This is supportive of the work of Fullerton et al., (1992), Alexander & Wells (1991) and Alexander (1993) in stressing that open discussion amongst firefighters themselves and with those in command seems to serve as a protective factor.

8.5 Implications for theories of PTSD

8.5.1 A spectrum of suffering

The fundamental theory of PTSD is that it is a disorder, which is axiomatic given its inclusion in successive editions of the DSM. Criticisms of it, reviewed at chapter 1, include that it may be an invention or social construct; that it is not a discrete disorder and that that its diagnosis risks pathologising normality. This programme of research did not directly seek to investigate such criticisms, but their existence cannot be ignored since the ramifications of incorrect diagnosis are legal, economical, sociological and psychological. To a certain extent, DSM-5 has moved closer to accepting the concept of dimensionality, recognizing that the categorical approach "did not capture the widespread sharing of symptoms and risk factors across many disorders that is apparent in studies of comorbidity" (APA, 2013, p. 12). The DSM-5 structure has accordingly been changed and is "meant to

serve as a bridge to new diagnostic approaches without disrupting current clinical practice or research" (p. 13). (p. 13). However, the theory of PTSD as a "categorical entity as implied by the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*; APA, 2013)" (McNally et al., 2014, p.1) cannot be accommodated by the findings of these studies.

The arguments that dimensional classification is more appropriate than categorical is not confined to PTSD (see, e.g. Bentall, 2004 on psychosis). The broad range of responses reported in the studies' results suggests that PTSD is a dimensional construct supporting Ruscio, Ruscio & Keane's (2002) finding that individuals lie at different levels of response severity on a "stress -response continuum" (p. 299) and that PTSD can be seen as a dimensional phenomenon through latent profile analysis, confirmatory factor analysis and factor mixture models (Frankfurt et al., 2015). The practical ramifications of this, particularly for those multiply and chronically exposed to PTES, cannot be underestimated. The labelling of "mental disorder" given to an individual who does not have one has been the subject of concern expressed within the literature for many years, and the stigma attached to such a label may be particularly distressing for those serving in the military (Clement et al., 2015) or as first responders. Conversely, the dichotomous nature of the disorder does not permit acknowledgment of the normality of a range of responses and recognition of possibly transient, but nonetheless real suffering at sub-"clinical" levels. Citing Ruscio, Ruscio & Keane (2002), Brewin (2003, p.41) stated that "many of the so-called symptoms of PTSD form part of a recognizable nonpathological response to stress" but also stressed that PTSD does not pathologize these stress responses. He averred that "It is not the symptoms themselves, but rather their frequency, their persistence, their intensity, and their failure to become more benign with time that define the disorder" (Brewin, 2003, p. 42). This statement encapsulates the spectrum of suffering approach argued for, encompassing all experience of symptomatology from the lowest to the greatest.

If the dimension of distress suffered by those exposed to a PTE were to include symptomatology of the comorbid disorders of PTSD, depression, anxiety and alcohol misuse, an overall spectrum of suffering could be mapped. This echoes network analysis (Cramer et al., 2010) which connects symptoms rather than attempting "to purify discrete diagnostic constructs by identifying symptoms specific to certain disorders" (McNally et al., 2014, p.10). The spectrum of suffering does not differentiate between those who have reached a predetermined clinical level of symptomatology and those who have not: it holds within it all those exposed to a PTE and permits movement along the spectrum as suffering decreases or increases. This spectrum model would be beneficial particularly for those repeatedly exposed to PTEs;

may assist in reducing the stigma associated with mental disorders; and provides potential for screening purposes and peer group intervention, as discussed below.

8.5.2 Theories of PTSD: Nonreferent upward counterfactual thinking

The relationship between nonreferent counterfactual thinking and PTSD is explicable in the context of existing theories. Firstly, the process of nonreferent counterfactual thinking begins with a negative cognitive appraisal of the PTE supporting the cognitive model of PTSD (Ehlers & Clark, 2000) and the literature reviewed at chapter 3. It is proposed that this appraisal is generated by the cognitive dissonance (Festinger, 1957) arising between the actual outcome and that which was desired and that this unconsummated desire in turn generates a form of rumination upon the alternative reality.

This could also be representative of the SPAARS model (Dalgleish, 1999, 2004; Power & Dalgleish 1997), which holds that PTEs become TEs because they incorporate discrepancies from pre-existing schemas regarding the self and the world, as does Janoff-Bulman's (1992) social-cognitive theory of shattered assumptions. The discrepancy itself is also appraised, leading to "existential emotions" (Dalgleish, 2004) such as helplessness and horror (Dalgleish & Power, 2004, p. 1071). Attempted resolution of the discrepancy leads to the re-experiencing symptoms which themselves generate distress and lead to the avoidance symptoms.

The results of the qualitative study lent support to the operation of these models in suggesting that both helplessness and hopelessness occur when there is nothing which can be done to change an undesired outcome, either at the time or in the future, emotions which appear existential. Perhaps, imagining an outcome which would have been better than the actual outcome, but which cannot be changed because it was in the hands of "fate" rather than in those of a human, shatters the illusion that the world is benevolent and meaningful because bad things happen irrespective of human agency.

The finding also supports Roese, (1997) in that a circular loop is created such that "negative affect unleashes counterfactual thinking, which then increases negative affect, further activates counterfactual thinking, and so on" (Roese, 1997, p. 144). Thus, the loop transforms a healthy and adaptive (Roese, 1997) cognitive process into maladaptive repetitive, cyclical, negative thinking (Birrer & Michael, 2011), reminiscent of what El Leithy, Brown & Robbins (2006, p. 630) describe as "PTSD ruminations". Such focus on alternatives to reality may maintain or increase PTSD symptoms (El Leithy, Brown & Robbins, 2006; Michael et al., 2007). Further, this mental construct possibly constitutes a form of cognitive

avoidance which hinders emotional processing (Michael et al., 2007) resulting "in an adverse cost-benefit ratio of experienced discomfort relative to successful processing" (El Leithy, Brown & Robbins, 2006 p. 634).

8.5.3 Theories of PTSD: self-defeating humour

The cognitive model of PTSD (Ehlers & Clark, 2000) is supported by the emergence of self-defeating humour as an independent predictor of PTSD in that it constitutes a negative appraisal of self because it is self-disparaging. Qualified support is also given to the appraisal/coping model (Lazarus & Folkman, 1984) insofar as it is proposed that self-defeating humour may constitute a coping response to the appraised stressor of unwanted banter.

The finding that self-defeating humour predicts higher levels of PTSD symptomatology extends the increasing literature of similar findings on negative cognitive predictors, reviewed at chapter 3. More specifically, it extends the literature on negative self-appraisals including pre-trauma negative appraisals of self (Bryant & Guthrie, 2005;2007); negative cognitions with relation to self (Dunmore, Clark & Ehlers; 1997; 2001; Clohessy & Ehlers, 1999; O'Donnell et al., 2007; Lancaster, Rodriguez & Weston, 2011; Constans et al., 2012) which differentiate PTSD from complicated grief (Golden & Dalgleish, 2012). The finding provides further support for the comments: "Mounting empirical data suggests that it may be that negative thoughts about the self are truly the best and most reliable predictors of distress after traumatic events" (Lancaster, Rodriguez & Weston, 2011, p. 199). As DiGangi et al., (2013, p. 740) pointed out, PTSD "definitionally, involves a negative disposition". Such dispositions or personality traits may influence appraisal of a PTE, for example, those with high levels of negativism (a "negative, dissatisfied, and hostile attitude") may appraise a situation as more alarming than those without, therefore becoming more anxious (Bramsen, Dirkzwager & van der Ploeg, 2000, p.1116).

In the absence of literature associating a humour style with PTSD symptomatology, two possible theories emerge. It is first proposed that self-defeating humour operates within the cognitive model of PTSD such that firefighters may indulge in it because it reflects their own negative appraisal of self. This may reflect a wider trait, as the tendency to think negatively about oneself may indicate neuroticism, which predicted posttraumatic symptomatology in firefighters (McFarlane, 1989), and has previously been associated with self-defeating humour (Martin et al., 2003; Veselka et al., 2010a), but as neuroticism was not measured, this can only be speculated.

Secondly, in a maladaptive example of the appraisal/coping model, it is proposed that self-defeating humour might be operated as a pre-emptive defence mechanism by firefighters anticipating the banter of others, and getting in first before they can be subjected to perceived rejection by their peers. This "jeer pressure" (Janes & Olson, 2000) arises when another person is being mocked and the observer falls into line with it to conform and avoid rejection. In this way, self-defeating humour would operate as a safety measure, ensuring that the firefighter stays within the group and is not rejected, which, given the importance of the firefighter second family unit, might be considered essential.

Is banter, then, self-defeating humour? It seems the answer depends on the purpose of the banter. The theory is advanced that the fundamental purpose of firefighter banter is self-protection because it neutralises unwanted emotions and helps one to cope and thus is self-enhancing. However, if it used as an "ingratiating", "excessively self-disparaging" style, "allowing oneself to be the 'butt' of others' humor, and laughing along with others when being ridiculed …" (Martin et al., 2003, p. 54), it would be self-defeating. Thus, banter would be both adaptive and maladaptive as a coping mechanism dependent on its context.

The second purpose of banter is to bond, which is achieved by the use of their private language. Where the banter itself is created not to protect oneself but with the sole intention of making others laugh as "spontaneous witty banter" Martin et al., 2003, p. 53), it could more accurately be designated as affiliative, which did not appear to be independently predictive of adaptive or maladaptive psychological symptomatology.

Alternatively, banter might not be entirely captured by the HSQ but stand alone as a humour style reflecting "piss-taking" across a spectrum ranging from adaptive to maladaptive. To determine whether this is the case, a "banter questionnaire" might usefully be developed, as discussed below.

8.5.4 Theories of PTSD: Meaning and the handling of the dead

Firefighters involved in body handling had higher PTSD symptomatology in the short term, and aspects of body handling are considered by many firefighters to be distressing enough to seek to avoid them by, for example, avoiding focusing on the dead or mentally transforming the dead through objectification or humour. This finding is accommodated by the cognitive model of PTSD (Ehlers & Clark, 2000), the ecosystemic model (Peterson et al., 1991), and the SPAARS model (Dalgleish, 1999, 2004; Power & Dalgleish 1997; 1999; Dalgleish & Power, 2004) to an extent. Although the event may be negatively appraised in line with the cognitive model (Ehlers & Clark, 2000), it seems that the personal meaning it

holds for the individual is critical (e.g. Marmar et al., 1996). As Turnbull (2011, p. 305) expressed it "the individual isn't vulnerable, it's the *meaning* they attribute to the experience that ultimately decides whether or not they develop a traumatized reaction". It is possible that the individual meaning ascribed to the dead and/or dissonance between the desire to respect the dead and the living activate pre-existing schemas about the self or the world (Marmar et al., 1996; Dalgleish & Power, 2004). Although it may be possible to change some negative, unrealistic beliefs or attributions, in some cases the individual's reaction may simply arise through the recognition of the humanity of the dead, a recognition which should be respected. It is suggested that the meaning behind the traumatic event for the individual is insufficiently explored, particularly in the first responder literature, and may form an important component of models of PTSD.

8.6 Implications for research

8.6.1 A spectrum of suffering

McNally et al., (2014) cite Cramer et al., (2010) in commenting that network analysis solves the comorbidity problem and that the transdiagnostic approach (Insel et al., 2010) would mesh with the network approach. Ruscio, Ruscio & Keane (2002), also cited by McNally et al., (2014) advocated a continuum approach to the identification of PTSD symptomatology. DSM-5 states that its restructuring and more dimensional approach "can facilitate research across current diagnostic categories by encouraging broad investigations within the proposed chapters and across adjacent chapters" (p.13).

The creation of a spectrum of suffering amalgamating the symptomatology of the four conditions would move from a focus on the individual constructs created by diagnostic criteria to an identification of overall suffering and impairment.

It is further proposed that a brief transdiagnostic screening instrument be devised to incorporate symptomatology and impairment measures for the four conditions studied. For PTSD, the TSQ showed efficiency in prediction of 90% when respondents could "endorse any combination of six or more re-experiencing and arousal symptoms" (Brewin et al., 2002, p. 160). The TSQ was as adequate as a screening measure as the IES-R in a comparison study of three screening instruments, although they were described as "poor in identifying non-cases" (Mouthaan et al., 2014, p.5). Investigation is warranted into the efficiency of a modified TSQ, including the re-experiencing and arousal symptoms,

but including DSM-5 (APA, 2013) Criterion D "persistent and exaggerated negative beliefs or expectations about oneself, others, or the world". This would capture the cognitions theorised to explain the predictive nature of nonreferent upward counterfactual thinking. Further, Criterion G (formerly F) now captures distress and impairment, but specific markers of impairment require identification. The addition of brief measures, such as the PHQ-9, the GAD-7 and CAGE used in these studies would identify symptomatology across all four conditions. Finally, the screening instrument should include questions as to the meaning of the stressor for the exposed individual. In hindsight, it is a matter of regret that Studies 1 and 2 did not include a measure of DSM-IV Criterion F impairment. Such a measure would have provided important data on levels of suffering beyond pure diagnostic criteria. These might have included factors such as suicidality, interpersonal difficulties and self-medication, examples given as potentially more predictive than symptom severity alone (Ruscio, Ruscio & Keane, 2002).

It is proposed that a spectrum of suffering would mesh with the transdiagnostic and network approaches, but would be presented in a way which avoids the connotations inherent in diagnosis of mental disorders. Provided that the instruments used were validated for the identification of symptomatology at a clinical level, individuals lying on the upper levels of the spectrum would still be able to access disorder-specific treatment. The construction of an instrument measuring symptomatology, psychological and behavioural factors and impairment which provides a swift, screening indicator of positioning on such a spectrum is indicated.

8.6.2 Counterfactual thinking

Research into counterfactual thinking and associations with PTSD remains relatively sparse, and the finding that nonreferent upward counterfactuals independently predicted higher symptomatology of PTSD requires replication, particularly within the emergency responder population. This is so because non-referent counterfactuals reported on interview arose due to perceived inadequacy of resources, a situation which evokes powerful reactions in emergency workers (Declercq et al., 2011) and occupational stress significantly predicts symptomatology in firefighters (Meyer et al., (2012).

The CTNES is a useful instrument for the identification of direction and nature of counterfactuals but should be combined with questions isolating the perceived cause of them, for example "When 'if only' thoughts arose, what were the actual and preferred outcomes for you?" This has practical implications, discussed below.

8.6.3 Humour

Future research is indicated in the domain of humour style in firefighters building upon Study 1, which examined both detrimental and benign humour styles as recommended (Kuiper,2012) and black humour as recommended (Sliter, Kale & Yuan, 2013). Although the positive style of self-enhancing humour predicted lower levels of depression, it is notable that neither positive style predicted lower levels of PTSD. This is thought provoking, as if the results of this study can be replicated, the inference would be that humour style of itself does not protect against the development of PTSD nor help to create resilience against the risks inherent in multiple, chronic exposure to PTEs for firefighters. On the other hand, if the finding is replicated that self-defeating humour predicts higher PTSD symptomatology, a marker for vulnerability exists which raises practical questions such as whether a "style" of humour can be changed.

Black humour was designated neither positive nor negative, but it returned no relationship with any form of symptomatology. This may be because, although the subscale designed displayed good psychometric properties, it may not have sufficiently captured the essence of this humour, and more direct, specific examples of black humour may have produced different results. Secondly, it is possible that black humour is genuinely neither positive nor negative and therefore has no effect on the development of any symptomatology. Thirdly, it is possible that black humour deployed to distance oneself from distressing scenes is actually captured by the self-enhancing style "as a healthy defence mechanism" (Martin et al., 2003, p. 53) if it is used "in a way that is tolerant and non-detrimental to others" (Martin et al., 2003, p. 52), subsuming it in the finding that this style predicted lower depression symptomatology. Fourthly, it is possible that participants' responses do not accurately reflect the usage of such humour, given that it is private and possibly considered to be in bad taste.

Rather than focusing in the future on black humour as a discrete style, it is suggested that banter be investigated through the development of a questionnaire designed to capture "piss-taking" both out of others and out of situations. Identification of examples of banter should ideally be achieved through an initial survey of first responders building upon the examples given by firefighters in this programme of research. Critical questions would include how the participant felt when either taking the piss or having the piss taken out of him/herself, whether the participant generated banter, whether s/he found banter amusing or offensive; whether s/he used banter only at work or with family/friends; how s/he began using banter; and whether the use of banter helped him/her to cope and in what way. Testing of the "rules" of banter could also be accomplished through the questionnaire. This would help to achieve the

testing of the theoretical mechanisms through which coping humour appears to work, including social bonding (Sliter, Kale & Yuan, 2013) and has important implications in practice as to the value of organisational systems such as the "watch" to which individual firefighters belong.

Interviews revealed the ability of some firefighters to transpose images from bodies into objects through humour in a variant of the visualisation technique reported by Taylor & Frazer (1982). As a distancing and coping mechanism, this warrants further investigation, particularly into the circumstances in which it may be protective or harmful as the literature does not demonstrate as yet whether avoidance of this type is adaptive in the long term (see Kirby, Shakespeare-Finch & Palk, 2011, p. 31 for discussion).

Replication of this research into detrimental and benign humour styles is called for within occupations involving repeated exposure to PTEs, including other first responders and the military, where the use of humour as a bonding and coping mechanism may be a critical element. The challenge in gaining access may be met through enlisting the support of sympathetic "insiders" to help pave the way, as was invaluable in these studies, and in emphasising the benefits such research is expected to have for potential participants and their peers.

8.6.4 Exposure to the dead

The results of the studies focusing on one critical, fatal incident suggest that there is a vulnerability to PTSD symptomatology in the short term. Research into the effects of exposure to the dead remains sparse, as it was over thirty years ago when Taylor & Frazer (1982) described their "fruitless" search for studies of body handlers as "It was as if a mantle either of silence or of neglect had settled on a taboo research topic" (p. 5).

Future directions for research include the administration of large-scale, longitudinal studies incorporating exposure to children, colleagues and personal effects; existence of external cues such as media reports, pictures, and knowing the victim or family; and poignancy of dates/anniversaries. Of critical importance is examination of associations between distress and exposure to the face and eyes of the deceased. This is so because of the dissonance which arises from the contrary desires to honour the dignity of the dead whilst simultaneously protecting fellow responders from distress.

8.7 Implications for practice

8.7.1 A spectrum of suffering

To paraphrase the conclusions of Ruscio, Ruscio & Keane (2002), when cut-off points for diagnosis of a disorder are prescribed, those falling beneath may be denied compensation and treatment, despite suffering symptomatology. A dimensional concept permits a position where clinical and non-clinical responses are continuous and may be measured by the severity with which they are experienced. A dimensional construct is particularly important for those whose occupation involves repeated exposure to PTEs, since an individual could move along the spectrum in either direction following exposure, after the passage of time or following intervention or treatment. As all of us lie somewhere on the spectrum, scores would reflect a current level of suffering overall and no labelling of a potentially stigmatising psychiatric disorder attached, such stigma being a particular hindrance for, amongst other groups, men and the military in seeking help (Clement et al., 2015). Further, those lying on different levels of the spectrum may require and respond to different interventions or therapy, as noted by Ruscio, Ruscio & Keane (2002).

If the spectrum questionnaire were routinely administered, either on a regular basis irrespective of exposure or in response to exposure, perhaps at debriefing, it could become a normal part of occupational life. The questionnaire could be administered by trained volunteer peers. This takes a potential "intervention" out of the hands of clinicians outside the organisation and brings it within, addressing any wariness of mental health practitioners. If some trained peers held a supervisory rank and were clearly empathetic and open regarding their own experiences, responders would benefit from this aspect of social support. Clearly, higher positions on the spectrum would highlight the need for external professional help, but even this could become viewed as normal if not labelled as a psychiatric disorder, but as a level of suffering likely, but not inevitably, to be transient.

Naturally, objections will be raised because diagnosis confers pathology, opening the gateway to mental health treatment and potentially financial compensation, and without an either/or diagnosis, how would this be achieved? A partial answer would seem to be to achieve agreed levels of suffering on the spectrum at which some form of treatment and appropriate compensation would be indicated, although this would not be entirely without difficulty. That, however, seems an inadequate reason to ignore the empirical evidence in favour of a dimensional construct and the humane advantages it would confer.

8.7.2 Humour

Given that firefighter humour, or banter, is endemic within the occupation, it is of particular importance that it is understood in what regard it may be beneficial or detrimental and it is currently unclear whether banter is either or both. It is theorised that, dependent upon the way in which it is used and experienced, it could either be self-enhancing or self-defeating in style. If the finding that self-defeating humour is detrimental can be replicated, particularly within the fire services, then psychoeducation appears necessary so that firefighters are made aware that banter of a particularly self-disparaging nature is detrimental to some. It is not suggested that the culture of banter be undermined, but that individual differences in the experience of it should be understood and respected. For those with a tendency to use self-defeating humour, it would seem that a cognitive behavioural intervention might be of benefit in addition to psychoeducation.

Development of a questionnaire designed to capture "piss-taking" as noted above would have practical implications for first responders and those working in emergency departments or studying as medics. Beneficial aspects of banter may emerge and more understood about the mechanisms which underlie the social support system of firefighters, given the importance of positive social support in the aftermath of PTEs. In addition, banter expressed as macabre or black humour may be an important means of coping with stressful incidents such that psychoeducation with, again, the support of supervisors may help to remove the discomfort some firefighters express at its use.

8.7.3 Exposure to the dead

The interviews supported the literature suggesting that informal advice is given to avoid looking at the victim and that attempts are also made cognitively to "dehumanise" the individual. As it is currently unknown whether this is beneficial in the long term, understanding of the dissonance created by the visceral need to respect the dead conflicting with the compassion a responder feels for colleagues requires reinforcement through psychoeducation. It seems vital that responders understand that there is no "correct" answer to the dilemma but that both covering and not covering the face are normal responses made under pressure, and that no long term effects of making either decision are known.

8.7.4 Psychoeducation in general

The findings relating to occupational and exposure variables should be communicated to fire services to raise awareness of potential vulnerability, and possibly reinforced during debriefing following a

potentially psychonoxious critical incident. In this way, supervisors could seek to “normalise” the experience of strong emotions. It is not immediately clear what the implications would be for the vulnerability of day crew to psychological suffering, but awareness is the first step that could be taken. Given that it is normal for day crew to experience some suffering , perhaps because of their constant proximity to their occupation, offering support and access to psychological treatments where required might be of merit.

But the essence of psychoeducation is normalisation. A range of responses to PTEs and to stress in general is to be expected, and acknowledgement of the many individual differences existing within the firefighter group is perhaps the most important practical contribution these studies can make. Even before further research is carried out, the concept of a spectrum of suffering along which all humans lie, and across which anyone can move in either direction, merits communication to firefighters of all ranks. This could be achieved through a programme with representatives of fire services which could then be transmitted by them to their peers within their organisations in a similar manner as is TRiM, a traumatic stress management system, delivered through peers in the military, see, e.g. Jones, Roberts & Greenberg (2003). As a weapon to combat stigma and foster a sense of normality even under severe pressure, has the potential to be powerful and liberating.

8.8 Strengths and limitations

These were discussed with specific reference to each of the three studies in chapters 5, 6 and 7. In essence, each study addressed limitations in the previous one. Study 1 was cross-sectional in design, which limits inferences as to the direction of relationships (Meyer et al., 2012) but it assessed four outcome variables (PTSD, depression, anxiety and alcohol misuse) which extends the literature on UK firefighters. Study 2 was longitudinal, limited in size by the number of firefighters exposed to a critical incident, but extending the firefighter literature which contains comparatively few longitudinal studies and providing insight into psychopathological risks firefighters face when exposed to the dead. Although a quantitative investigation into these risks was not possible, study 3 enabled a much deeper exploration which enriched the data collected in study 2. The studies were representative of UK firefighters in that participants had a wide range of years of experience, levels of seniority and exposure and were drawn from a variety of geographical locations.

8.9 Last words

Together, these three studies explored resilience and vulnerability in UK firefighters to psychopathology in four domains and revealed pre-trauma, peritrauma and post-trauma elements which appear to be psychonoxious. Although most are resilient to levels of suffering which suggest diagnostic caseness, it is clear that suffering lies on a spectrum from the lowest to the highest and that all responses are to be expected. It is suggested that the attribution of labels of psychiatric diagnoses, whilst clearly useful in many respects, risks attribution of something else as well – the stigma which may be perceived to be associated with "mental illness". For this reason, a spectrum of suffering rather than a diagnostic dichotomy is more merciful, permitting an individual access to help and support at all levels of suffering, permitting movement across the spectrum as suffering rises and falls, and avoiding the pathologization of normality.

Importantly also, the essence of firefighter resilience lies in their camaraderie, bantering style of humour and strong team work which underlie the strength of their "second family" bond and in the professional pride, sense of duty and pleasure they have in their work. As this was succinctly expressed by one firefighter, he has the last words: "We are the Fire Service".

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Appendix A: Study 1 Questionnaire

Please enter your allocated number here:

Our Questionnaire is made up of a number of smaller questionnaires. Sometimes the answers need to be given by circling/ticking a number or statement, sometimes by filling in a number on

a scale, sometimes by giving information, and so on. Please read the instructions at the top of each individual questionnaire carefully, and indicate your answers appropriately.

Please note that some of these questions are personal and may be sensitive to you. If you do not wish to answer them, please do not do so. You are entirely free to do this without any consequences to you.

The following questions are about you and your background. Please TICK the correct response.

1. Are you:
   - Whole Time
   - Retained
   - Day Crew
   - Other (please specify) _____

2. Are you:
   - Male
   - Female

3. Are you:
   - Single
   - Co-habiting
   - Married
   - Separated
   - Divorced
   - Widowed
   - In a civil partnership
   - Other (please specify) _____

4. Please think about the person who you would say is the closest to you **outside of work** and either put down their initials or name _____

5. Have you ever been divorced/separated:
   - Yes
   - No

6. Do you have children/step-children or other dependants under the age of 18?
   - Yes
   - No

7. What are the highest vocational/academic qualifications you have attained:
   - None
   - NVQ
   - Diploma
   - GCSE
   - A Level
   - Undergraduate degree
   - Post-graduate degree

Other (please specify)

---

8. Is your length of service:

0-5 years
6-10 years
11-17 years
Over 17 years

---

9. What is your rank:

Firefighter
Crew Commander
Watch Commander
Officer

---

10. Is your fire station:

Urban (city or town)
Semi-rural (small town in countryside)
Rural (in countryside away from town)
Other (please specify)

---

11. How would you describe your ethnic group

White
British
Irish
Any other White background
All White groups
Mixed
White and Black Caribbean
White and Black African
White and Asian
Any other Mixed background
All Mixed groups
Asian or Asian British
Indian
Pakistani
Bangladeshi
Any other Asian background
All Asian groups
Black or Black British
Caribbean
African
Any other Black background
All Black groups
Chinese or other ethnic group
Chinese
Any other ethnic group

All Chinese or other ethnic group
All Ethnic groups
Not stated

12. Have you sought medical assistance in connection with your work during the following time periods? Please **TICK** the correct box(es):

	Last Month	Last 6 months	Last Year	During service
Yes				
No				

13. Have you ever been diagnosed with a psychiatric illness for which you received medical assistance?
If so, please **CIRCLE** "Yes" and fill in the following
If not, please **CIRCLE** "No"

	Diagnosis	Treatment	Date of Diagnosis
Yes			
No			

14. Have you ever been prescribed any medication for mental health during the following time periods? Please **TICK** the correct box(es).

	Last Month	Last 6 months	Last Year	During service
Yes				
No				

15. Have you sought counselling or other mental health assistance during the following time periods? Please **TICK** the correct box(es).

	Last Month	Last 6 months	Last Year	During service
Yes				
No				

16. Do you suffer from a disability of any kind?

If so, please **CIRCLE** "Yes" and specify the nature of the disability.
If not, please **CIRCLE** "No"
Yes (please specify)_____
No

17. Please CIRCLE either "Yes" or "No" after each of the following four questions:

Have you ever felt you ought to cut down on your drinking?	Yes	No
Have people annoyed you by criticising your drinking?	Yes	No
Have you ever felt bad or guilty about your drinking?	Yes	No
Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover (Eye-opener)?	Yes	No

18. Prior to becoming a firefighter, were you ever employed in the military or with any first responder organisation?

If so, please **CIRCLE** "Yes" and fill in the following
If not, please **CIRCLE** "No" Yes No

	Organisation	Length of service	Rank at end of service
Yes			
No			

These questions are about incidents you may have experienced during your time as a firefighter.

Please enter a **NUMBER** from 0 (zero) upwards under each heading:

1. Estimate how many of the following incidents you have experienced in these categories from 0 (zero) upwards:

RTC	Last Month	Last 6 months	Last Year	During service
Fires	Last Month	Last 6 months	Last Year	During service
Other (specify)	Last Month	Last 6 months	Last Year	During service

2. Estimate how many of the following incidents you have experienced in these categories from 0 (zero) upwards:

Persons Trapped/ Reported In:	Last Month	Last 6 months	Last Year	During service
RTC				
Fire				
Other				
Fatal Injury to members of the public	Last Month	Last 6 months	Last Year	During service
Serious injury to member(s) of the public	Last Month	Last 6 months	Last Year	During service
Serious injury to colleague	Last Month	Last 6 months	Last Year	During service
Fatal injury to colleague	Last Month	Last 6 months	Last Year	During service
Serious injury to you	Last Month	Last 6 months	Last Year	During service
Perceived danger to you	Last Month	Last 6 months	Last Year	During service

Perceived danger to colleagues	Last Month	Last 6 months	Last Year	During service
Perceived danger to member of public	Last Month	Last 6 months	Last Year	During service

3. Please enter the NUMBER of times you have been actively involved in the recovery, attempted resuscitation or transportation of someone who died during the incident. Enter a number from 0 (zero) upwards.

	Last month	Last 6 months	Last year	During service
Colleague				
Civilian				

4. If you have experienced an event or events that involved actual or threatened death or serious injury to anyone during your service, did your response to this event (or these events) involve intense fear, helplessness or horror?
   Please TICK the correct box.

	Never 1	Sometimes 2	Often 3	Always 4
Intense fear				
Helplessness				
Horror				

5. Have you experienced, witnessed or been confronted with, an event or events that involved actual or threatened death or serious injury to anyone **OUTSIDE** of your service as a firefighter: (e.g before you entered service or during your time as a firefighter, but outside work)?

   If so, please fill in an estimated NUMBER from 0 (zero) upwards showing how many such times this has happened to you in each time period.

   Never Last month Last 6 months Last year During service

   Did your response to this event (or these events) involve intense fear, helplessness or horror?

Please TICK the correct box.

	Never 1	Sometimes 2	Often 3	Always 4
Intense fear				
Helplessness				
Horror				

Would you please now think of **an incident you remember well** during you time as a firefighter which involved any or all of the following:

Incident involved:	**Tick any/all of the following which apply**
Actual death of a civilian	
Actual death of a colleague	
Actual serious injury to you	
Actual serious injury to civilian	
Actual serious injury to colleague	
Threatened death/serious injury to you	
Threatened death/serious injury to civilian	
Threatened death/serious injury to colleague	

Please write down when this incident occurred:_____

In some questionnaires, we will refer to this incident as **"the incident you remember well"**, and will be asking you to answer questions with it in mind.

Below is a list of difficulties people sometimes have after stressful life events.
Please read each item, and then indicate how distressing each difficulty has been for you DURING THE PAST SEVEN DAYS **with respect to the incident you remember well.**
How much were you distressed or bothered by these difficulties?

	Not At all	A Little bit	Mode-rately	Quite a bit	Ext-remely
1. Any reminder brought back feelings about it.	0	1	2	3	4
2. I had trouble staying asleep.	0	1	2	3	4
3. Other things kept making me think about it.	0	1	2	3	4
4. I felt irritable and angry.	0	1	2	3	4
5. I avoided letting myself get upset when I thought about it or was reminded of it	0	1	2	3	4
6. I thought about it when I didn't mean to	0	1	2	3	4
7. I felt as if it hadn't happened or wasn't real	0	1	2	3	4
8. I stayed away from reminders about it	0	1	2	3	4
9. Pictures about it popped into my mind	0	1	2	3	4
10. I was jumpy and easily startled	0	1	2	3	4
11. I tried not to think about it	0	1	2	3	4
12. I was aware that I still had a lot of feelings about it, but I didn't deal with them	0	1	2	3	4
13. My feelings about it were kind of numb	0	1	2	3	4
14. I found myself acting or feeling as though I was back at that time	0	1	2	3	4
15. I had trouble falling asleep	0	1	2	3	4
16. I had waves of strong feelings about it	0	1	2	3	4
17. I tried to remove it from my memory	0	1	2	3	4
18. I had trouble concentrating	0	1	2	3	4
19. Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea or a pounding heart	0	1	2	3	4
20. I had dreams about it	0	1	2	3	4
21. I felt watchful or on-guard	0	1	2	3	4
22. I tried not to talk about it	0	1	2	3	4

Over the LAST 2 WEEKS how often have you been bothered by any of the following problems?

Not at all	Several days	More than half the days	Nearly everyday
0	1	2	3

1.	Feeling nervous, anxious or on edge?	0	1	2	3
2.	Not being able to stop or control worrying?	0	1	2	3
3.	Worrying too much about different things?	0	1	2	3
4.	Trouble relaxing?	0	1	2	3
5.	Being so restless that it is hard to sit still?	0	1	2	3
6.	Becoming easily annoyed or irritable?	0	1	2	3
7.	Feeling afraid as if something awful might happen?	0	1	2	3

Over the LAST 2 WEEKS how often have you been bothered by any of the following problems?

Not at all	Several days	More than half the days	Nearly everyday
0	1	2	3

1.	Little interest or pleasure in doing things?	0	1	2	3
2.	Feeling down, depressed, or hopeless?	0	1	2	3
3.	Trouble falling or staying asleep, or sleeping too much?	0	1	2	3
4.	Feeling tired or having little energy?	0	1	2	3
5.	Poor appetite or overeating?	0	1	2	3
6.	Feeling bad about yourself – or that you are a failure or have let yourself or your family down?	0	1	2	3
7.	Trouble concentrating on things, such as reading the newspaper or watching television?	0	1	2	3
8.	Moving or speaking so slowly that other people could have noticed?	0	1	2	3
	Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual?	0	1	2	3
9.	Thoughts that you would be better off dead, or of hurting yourself in some way?	0	1	2	3

Most people experience unpleasant and/or unwanted thoughts (in verbal and/or picture form), which can be difficult to control. Below are a number of things people do to control these thoughts.

Please bring to mind the incident you remember well, then read each statement carefully, and indicate how often you used each technique by CIRCLING the appropriate number. There are no right or wrong answers. Do not spend too much time thinking about each one.

When I experienced an unpleasant/unwanted thought:

		Never	Some-times	Often	Almost always
1	I called to mind positive images instead	1	2	3	4
2	I told myself not to be so stupid	1	2	3	4
3	I focused on the thought	1	2	3	4
4	I replaced the thought with a more trivial bad thought	1	2	3	4
5	I didn't talk about the thought to anyone	1	2	3	4
6	I punished myself for thinking the thought	1	2	3	4
7	I dwelt on other worries	1	2	3	4
8	I kept the thought to myself	1	2	3	4
9	I occupied myself with work instead	1	2	3	4
10	I challenged the thought's validity	1	2	3	4
11	I got angry at myself for having the thought	1	2	3	4
12	I avoided discussing the thought	1	2	3	4
13	I shouted at myself for having the thought	1	2	3	4
14	I analysed the thought rationally	1	2	3	4
15	I slapped or pinched myself to stop the thought	1	2	3	4
16	I thought pleasant thoughts instead	1	2	3	4
17	I found out how my friends deal with these thoughts	1	2	3	4
18	I worried about more minor things instead	1	2	3	4
19	I did something that I enjoy	1	2	3	4
20	I tried to reinterpret the thought	1	2	3	4
21	I thought about something else	1	2	3	4
22	I thought more about the more minor problems I had	1	2	3	4
23	I tried a different way of thinking about it	1	2	3	4
24	I thought about past worries instead	1	2	3	4
25	I asked my friends if they have similar thoughts	1	2	3	4
26	I focused on different negative thoughts	1	2	3	4
27	I questioned the reasons for having the thought	1	2	3	4
28	I told myself that something bad will happen if I think the thought	1	2	3	4
29	I talked to a friend about the thought	1	2	3	4
30	I kept myself busy	1	2	3	4

Please bring to mind the incident you remember well. Take a few moments to vividly recall that experience and what it was like for you.
Now, think about the types of thoughts you experienced following that incident. Using the following scale, rate the frequency with which you experienced the thoughts described below.

	Never	Rarely	Some-times	Often	Very Often
1. I thought about how much worse things could have been	1	2	3	4	5
2. If only another person (or other people) had not been so selfish, this whole mess could have been avoided	1	2	3	4	5
3. I thought about how much better things would have been if I had acted differently	1	2	3	4	5
4. I felt sad when I thought about how much better things could have been	1	2	3	4	5
5. I felt relieved when I thought about how much worse things could have been	1	2	3	4	5
6. If another person (or other people) had not been so inconsiderate, things would have been better	1	2	3	4	5
7. I wished I had a time machine so I could just take back something I said or did	1	2	3	4	5
8. I thought about how much better things could have been	1	2	3	4	5
9. I counted my blessings when I thought about how much worse things could have been	1	2	3	4	5
10. If only another person (or other people) would have acted differently, this situation would never have happened	1	2	3	4	5
11. If only I had listened to other people, things would have turned out better	1	2	3	4	5
12. I could not stop thinking about how I wished things would have turned out	1	2	3	4	5
13. Although what happened was negative, it clearly could have been a lot worse	1	2	3	4	5
14. If only another person (or other people) had spoken up at the time, the situation would have turned out better	1	2	3	4	5

15. I thought about how much better things could have been if I had not failed to take action	1	2	3	4	5
16. Although the bad situation was nobody's fault, I thought about how things could have turned out better	1	2	3	4	5

People experience and express humour in many different ways. Below is a list of statements describing different ways in which humour might be experienced.

Please bring to mind the incident you remember well, then read each statement carefully, and indicate the degree to which you agree or disagree with it.
You will see that the statements are duplicated.

First, you are asked how you reacted **at work.** The expression "work colleagues" means all the people you encounter within the Service, of whatever rank.

Secondly, you are asked how you reacted **with the person closest to you.** That person will be the one you thought of when you were asked to think about the person who you would say is the closest to you outside of work and either put down their initials or name.
In the questionnaire, **we have called that person X.**

So, for example, if your partner or best friend (outside work) were the person you said was the closest to you, answer the following questions with that person in mind.
Please respond as honestly and objectively as you can.

Use the following scale:

Totally Disagree	Moderately Disagree	Slightly Disagree	Neither agree or disagree	Slightly agree	Moderately agree	Totally Agree
1	2	3	4	5	6	7

1	I did not usually laugh or joke around much with my work colleagues	1	2	3	4	5	6	7
2	I did not usually laugh or joke around much with X	1	2	3	4	5	6	7
3	If I was feeling depressed while at work, I could usually cheer myself up with humour	1	2	3	4	5	6	7
4	If I was feeling depressed while with X, I could usually cheer myself up with humour	1	2	3	4	5	6	7
5	If someone made a mistake at work, I would often tease them about it	1	2	3	4	5	6	7
6	If X made a mistake, I would often tease him/her about it	1	2	3	4	5	6	7
7	I let my work colleagues laugh at me or make fun at my expense more than I should	1	2	3	4	5	6	7
8	I let X laugh at me or make fun at my expense more than I should	1	2	3	4	5	6	7
9	I didn't have to work very hard at making my work colleagues laugh – I seem to be a naturally humorous person	1	2	3	4	5	6	7

Totally Disagree	Moderately Disagree	Slightly Disagree	Neither agree or disagree	Slightly agree	Moderately agree	Totally Agree
1	2	3	4	5	6	7

10	I didn't have to work very hard at making X laugh – I seem to be a naturally humorous person	1	2	3	4	5	6	7
11	Even when I was by myself while at work, I was often amused by the absurdities of life	1	2	3	4	5	6	7
12	Even when I was by myself, while not at work or without X, I was often amused by the absurdities of life	1	2	3	4	5	6	7
13	My work colleagues were never offended or hurt by my sense of humour	1	2	3	4	5	6	7
14	X was never offended or hurt by my sense of humour	1	2	3	4	5	6	7
15	I often got carried away in putting myself down if it made my colleagues laugh	1	2	3	4	5	6	7
16	I often got carried away in putting myself down if it made X laugh	1	2	3	4	5	6	7
17	I rarely made my work colleagues laugh by telling funny stories about myself	1	2	3	4	5	6	7
18	I rarely made X laugh by telling funny stories about myself	1	2	3	4	5	6	7
19	If I was feeling upset or unhappy while at work I usually tried to think of something funny about the situation to make myself feel better	1	2	3	4	5	6	7
20	If I was feeling upset or unhappy while I was with X, I usually tried to think of something funny about the situation to make myself feel better	1	2	3	4	5	6	7
21	When telling jokes or saying funny things, I was usually not very concerned about how my work colleagues were taking it	1	2	3	4	5	6	7
22	When telling jokes or saying funny things, I was usually not very concerned about how X was taking it	1	2	3	4	5	6	7
23	I often tried to make my work colleagues like or accept me more by saying something funny about my own weaknesses, blunders or faults	1	2	3	4	5	6	7
24	I often tried to make X like or accept me more by saying something funny about my own weaknesses, blunders or faults	1	2	3	4	5	6	7
25	I laughed and joked a lot with my work colleagues	1	2	3	4	5	6	7
26	I laughed and joked a lot with X	1	2	3	4	5	6	7
27	My humorous outlook on life while at work kept me from getting overly upset or depressed about things	1	2	3	4	5	6	7

Totally Disagree	Moderately Disagree	Slightly Disagree	Neither agree or disagree	Slightly agree	Moderately agree	Totally Agree
1	2	3	4	5	6	7

28	My humorous outlook on life kept me from getting overly upset or depressed about things while I was with X	1	2	3	4	5	6	7
29	I did not like it when my work colleagues used humour as a way of criticising or putting someone down	1	2	3	4	5	6	7
30	I did not like it when X used humour as a way of criticising or putting someone down	1	2	3	4	5	6	7
31	I didn't often say funny things to put myself down at work	1	2	3	4	5	6	7
32	I didn't often say funny things to put myself down when I was with X	1	2	3	4	5	6	7
33	I usually didn't like to tell jokes or amuse my work colleagues	1	2	3	4	5	6	7
34	I usually didn't like to tell jokes or amuse X	1	2	3	4	5	6	7
35	If I was by myself and I was feeling unhappy at work, I made an effort to think of something funny to cheer myself up	1	2	3	4	5	6	7
36	If I was by myself when not at work and without X, I made an effort to think of something funny to cheer myself up	1	2	3	4	5	6	7
37	Sometimes when I was at work I thought of something that was so funny that I couldn't stop myself from saying it, even if it was not appropriate for the situation	1	2	3	4	5	6	7
38	Sometimes when I was not at work, but with X, I thought of something that was so funny that I could not stop myself from saying it, even if it was not appropriate for the situation	1	2	3	4	5	6	7
39	I often went overboard in putting myself down when I was making jokes or trying to be funny at work	1	2	3	4	5	6	7
40	I often went overboard in putting myself down when I was making jokes or trying to be funny with X	1	2	3	4	5	6	7
41	I enjoyed making my work colleagues laugh	1	2	3	4	5	6	7
42	I enjoyed making X laugh	1	2	3	4	5	6	7
43	If I was feeling sad or upset while at work, I usually lost my sense of humour	1	2	3	4	5	6	7
44	If I was feeling sad or upset while with X, I usually lost my sense of humour	1	2	3	4	5	6	7
45	I never participated in laughing at others when at work even if all my work colleagues were doing it	1	2	3	4	5	6	7
46	I never participated in laughing at others when I was with X, even if she/he was doing it	1	2	3	4	5	6	7

Totally Disagree	Moderately Disagree	Slightly Disagree	Neither agree or disagree	Slightly agree	Moderately agree	Totally Agree
1	2	3	4	5	6	7

47	When I was with my work colleagues, I often seemed to be the one that they made fun of or joked about	1	2	3	4	5	6	7
48	When I was with X, I often seemed to be the one she/he made fun of or joked about	1	2	3	4	5	6	7
49	I didn't often joke around with my work colleagues	1	2	3	4	5	6	7
50	I didn't often joke around with X	1	2	3	4	5	6	7
51	It was my experience that thinking about some amusing aspect of a situation was often a very effective way of coping with problems when at work	1	2	3	4	5	6	7
52	It was my experience that thinking about some amusing aspect of a situation was often a very effective way of coping with problems when I was with X	1	2	3	4	5	6	7
53	If I didn't like someone, I often used humour or teasing to put them down when I was at work	1	2	3	4	5	6	7
54	If I didn't like someone, I often used humour or teasing to put them down when I was with X	1	2	3	4	5	6	7
55	If I was having problems or feeling unhappy, I often covered it up by joking around, so that even my work colleagues didn't know how I really felt	1	2	3	4	5	6	7
56	If I was having problems or feeling unhappy, I often covered it up by joking around, so that even X didn't know how I really felt	1	2	3	4	5	6	7
57	I usually couldn't think of witty things to say when I was with my work colleagues	1	2	3	4	5	6	7
58	I usually couldn't think of witty things to say when I was with X	1	2	3	4	5	6	7
59	I didn't need to be with work colleagues to feel amused – I could usually find things to laugh about at work even when I was by myself	1	2	3	4	5	6	7
60	I didn't need to be with X to feel amused – I could usually find things to laugh about even when I was by myself	1	2	3	4	5	6	7
61	Even if something was really funny to me, I would not laugh or joke about it at work if my work colleagues would be offended	1	2	3	4	5	6	7
62	Even if something was really funny to me, I would not laugh or joke about it if X would be offended	1	2	3	4	5	6	7
63	Letting my work colleagues laugh at me was my way of keeping them in good spirits	1	2	3	4	5	6	7

Totally Disagree	Moderately Disagree	Slightly Disagree	Neither agree or disagree	Slightly agree	Moderately agree	Totally Agree
1	2	3	4	5	6	7

64	Letting X laugh at me was my way of keeping him/her in good spirits	1	2	3	4	5	6	7
65	I made a victim of the incident the butt of a joke when I was with my work colleagues	1	2	3	4	5	6	7
66	I made a victim of the incident the butt of a joke when I was with X	1	2	3	4	5	6	7
67	I made other first responders the butt of a joke when I was with my work colleagues	1	2	3	4	5	6	7
68	I made other first responders the butt of a joke when I was with X	1	2	3	4	5	6	7
69	Using black humour made me feel better when I was with my work colleagues	1	2	3	4	5	6	7
70	Using black humour made me feel better when I was with X	1	2	3	4	5	6	7
71	Colleagues using black humour did or would have offended me	1	2	3	4	5	6	7
72	X using black humour did or would have offended me	1	2	3	4	5	6	7

If you can, please briefly describe any jokes, anecdotes, games or pranks you made or were involved with during or after the incident

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Appendix B: Study 2 Questionnaire

Survey 2 – Please enter your allocated number here: _____
Our questionnaire is made up of a number of smaller questionnaires. Please read the instructions at the top of each individual questionnaire carefully, and indicate your answers appropriately.

Please note that some of these questions are personal and may be sensitive to you. If you do not wish to answer them, please do not do so. You are entirely free to do this without any consequences to you.

PART ONE: Please TICK the correct answer

Are you:	Whole time Retained Whole time and retained Day Crew Other (please specify)
Are you:	Male Female
Are you:	17 – 25 26 – 30 31 – 40 41 – 50 50 +
Is your length of service:	0 -5 years 6 -10 years 11 – 17 years 18 – 30 years 30 + years
What is your rank:	Firefighter Crew Commander Watch Commander Officer
Have you ever been diagnosed with a psychiatric illness for which you received medical assistance:	Yes No
Have you ever received counselling or other mental health assistance:	Yes No
Have you received counselling or other mental health assistance in connection with this incident:	Yes No

PART TWO: Please TICK either the "Yes" or "No" box for each question below and then answer the questions in either box 1 or box 2 as relevant

	Yes	No
Were you involved in the initial attendance?		
Were you involved in the body recovery?		

If the answer to either or both of the above questions was "yes", complete box 1.

1. Please describe what you did.

If the answer to either or both of the above questions was "no", complete box 2.

2. How did you learn about the incident?

Please tick the appropriate box below

Did your response to this incident involve:	Intense Fear	Helplessness	Horror	Any other emotional response (please specify)
Yes				
No				

PART THREE: Please answer the following questions by CIRCLING the appropriate number:

The incident	Never	Sometimes	Often	Almost always
Have you tried to suppress thoughts of the incident when they came into your mind?	1	2	3	4
Have you found yourself thinking "if only" or similar thoughts, which you would describe as regretful thoughts, in connection with this incident?	1	2	3	4
Have you used humour in relation to this incident?	1	2	3	4

Have you found anything particularly helpful in coping with this incident?

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

PART FOUR: Below is a list of difficulties people sometimes have after stressful life events.

Please read each item, and then indicate how distressing each difficulty has been for you DURING THE PAST SEVEN DAYS **with respect to the recent incident**.

How much were you distressed or bothered by these difficulties?

Not at all	A Little bit	Moderately	Quite a bit	Extremely
0	1	2	3	4

1. Any reminder bought back feelings about it	0	1	2	3	4
2. I had trouble staying asleep	0	1	2	3	4
3. Other things kept making me think about it	0	1	2	3	4
4. I felt irritable and angry	0	1	2	3	4
5. I avoided letting myself get upset when I thought about it or was reminded of it	0	1	2	3	4
6. I thought about it when I didn't mean to	0	1	2	3	4
7. I felt as if it hadn't happened or wasn't real	0	1	2	3	4
8. I stayed away from reminders about it	0	1	2	3	4
9. Pictures about it popped into my mind	0	1	2	3	4
10. I was jumpy and easily startled	0	1	2	3	4
11. I tried not to think about it	0	1	2	3	4
12. I was aware that I still had a lot of feelings about it, but I didn't deal with them	0	1	2	3	4
13. My feelings about it were kind of numb	0	1	2	3	4
14. I found myself acting or feeling as though I was back at that time	0	1	2	3	4
15. I had trouble falling asleep	0	1	2	3	4
16. I had waves of strong feelings about it	0	1	2	3	4
17. I tried to remove it from my memory	0	1	2	3	4
18. I had trouble concentrating	0	1	2	3	4
19. Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea or a pounding heart	0	1	2	3	4
20. I had dreams about it	0	1	2	3	4
21. I felt watchful or on-guard	0	1	2	3	4
22. I tried not to talk about it	0	1	2	3	4

Over the LAST 2 WEEKS how often have you been bothered by any of the following problems?

Not at all	Several days	More than half the days	Nearly everyday
0	1	2	3

1. Feeling nervous, anxious or on edge?	0	1	2	3
2. Not being able to stop or control worrying?	0	1	2	3
3. Worrying too much about different things?	0	1	2	3
4. Trouble relaxing?	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

Over the LAST 2 WEEKS how often have you been bothered by any of the following problems?

Not at all	Several days	More than half the days	Nearly everyday
0	1	2	3

1.	Little interest or pleasure in doing things?	0	1	2	3
2.	Feeling down, depressed, or hopeless?	0	1	2	3
3.	Trouble falling or staying asleep, or sleeping too much?	0	1	2	3
4.	Feeling tired or having little energy?	0	1	2	3
5.	Poor appetite or overeating?	0	1	2	3
6.	Feeling bad about yourself – or that you are a failure or have let yourself or your family down?	0	1	2	3
7.	Trouble concentrating on things, such as reading the newspaper or watching television?	0	1	2	3
8.	Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual?	0	1	2	3
9.	Thoughts that you would be better off dead, or of hurting yourself in some way?	0	1	2	3

Please CIRCLE either "Yes" or "No" after each of the following four questions:

Since the incident, have you felt you ought to cut down on your drinking?	Yes	No
Since the incident, have people annoyed you by criticising your drinking?	Yes	No
Since the incident, have you felt bad or guilty about your drinking?	Yes	No
Since the incident, have you had a drink first thing in the morning to steady your nerves or get rid of a hangover (Eye-opener)?	Yes	No

Please TICK the appropriate box below:

Has completing this questionnaire:	No	A Little	A moderate amount	Quite a lot	A lot
Caused you emotional distress?					
Been helpful to you in any way?					

THANK YOU FOR YOUR PARTICIPATION.

THIS STUY HAS BEEN APPROVED BY THE UNIVERSITY OF HERTFORDSHIRE PSYCHOLOGY ETHICS COMMITTEE UNDER PROTOCOL NUMBER PSY/02/12/LA

Appendix C: Guidance Notes for Interviews

METHOD

Volunteer participants who were involved in "the incident" complete the questionnaire set, "Incident Responses Survey 2", following a verbal introduction from the Facilitating Officer and the researcher, and having read the Information for Participants Sheet and read and signed the Participation Consent Form.

Those who wish to take part in an interview remain behind. A further introduction is given, and having read the Information for the Participants Sheet, participants read and sign the Interview Participation Consent Form.

The interview is recorded. The researcher introduces the subject matter and ask questions, inviting participants to respond by raising their hand. They introduce themselves using the randomly assigned number they have been given. They hold the microphone when they are speaking and then pass it to the next participant to ensure as much clarity as possible. It is up to the participants to determine the order in which they wish to speak and how and when they do so.

THOUGHT SUPPRESSION: since the incident

1. Have thoughts of the incident come into your mind afterwards?
2. Can you describe those thoughts?
3. Do you recall how you reacted to those thoughts?
4. Did you distract yourself in any way?
5. Did you talk about your thoughts to anyone?
6. Did you think about other bad thoughts or worries?
7. Did you get angry with yourself about having these thoughts?
8. Did you try to analyse or reinterpret the thoughts?
9. Do you still have thoughts about the incident?

COUNTERFACTUAL THINKING: since the incident

1. Have you thought "if only" in relation to this incident?
2. Have you thought "even if" in relation to this incident?
3. Do you have any regretful thoughts about this incident?
4. Do you have any positive thoughts about this incident?

HUMOUR: since the incident

1. Have you been involved in the expression of humour about this incident?
2. Can you give any examples?
3. Are you aware of any differences in the way humour is expressed or used depending upon the nature of the incident?
4. Can you describe the type of humour used at work on a day-to-day basis?
5. Do you think you use humour in a different way with your family members or those outside the Service?

THIS SECTION OF THE INTERVIEW INVOLVES DISCUSSION AS TO EMOTION/ MEANING AND PARTICIPANTS ARE OFFERED THE OPPORTUNITY TO LEAVE IF THEY WISH

AT THE TIME OF THE INCIDENT

1. Can you recall any thoughts you had at the time of the incident?
2. How did you react to those thoughts? (Did you replace the thoughts with something neutral or did you try and change the thoughts?)
3. Can you recall any emotions you felt at the time of the incident?
4. How did you react to these emotions?
5. Can you describe anything else about what was going on in your mind at the time?

INCIDENTS AND THEIR SEVERITY

6. If there was a scale of incident severity, starting from 0 = insignificant up to 10 = the utmost significant, where would this incident be on that scale?
7. Why?
8. Do some incidents cause you more distress/ difficult thoughts/ emotions than others?
9. Can you say why?
10. Are you aware of any particular emotions you have or states of mind you are in when dealing with an incident?

Appendix D: Table of Firefighter Studies

Author (first)	Nationality	Prevalence PTSD	Other disorders/distress	Associated with/predictive of PTSD
Alghamd, 2013	Saudi Arabia (exposed to ≥ 1 TE) *n* = 169/200)	57% full, 39% partial	High levels of depression & anxiety	High rate related to type & severity of TE & years of experience. Adaptive coping and higher perceived social support associated with lower levels.
Al-Naser, 1999	Kuwait (*n* = 108) CIs	18.5%		(Full results not available.)
Armstrong, 2014	Australia (*n* = 218)		PTG	Operational stress highest beta weight, then work-related reappraisal, organisational stress and trauma source. Higher work & personal trauma associated with higher symptoms. Increased use of work event reappraisal associated with higher PTSD levels. Social support not a predictor when other coping strategies controlled for. Organisational belongingness ('camaraderie') not associated with PTSD. Increases in self-care coping and trauma from multiple sources associated with PTG.
Avsec, 2012	Slovenia (*n* = 139) CIs			Non-constructive coping (mental disengagement, substance use) only significant predictor of PTSD symptoms on regression. Positive emotionality related to all constructive coping styles .
Bacharach, 2007	USA (*n* = 1,110) CIs			Unit-level climate-related buffering effects (support & control) uniquely buffered

	9/11 firefighters subsequently			intensity of 9/11 involvement on later emotional states.
Bacharach, 2008	USA (*n* = 1,481) CIs		Alcohol use	Intensity of involvement associated with drinking to cope; adequacy of resources implicated.
Baker, 2001	UK (*n* = 78) CIs		Psychological distress	Approach factor of self-appraised problem-solving contributes negatively to symptoms of distress after controlling for work stress.
Barnes, 1999/2000	Australia CIs, qualitative			Humour to mask anxiety, black humour, intrusive thoughts, anticipation, hypervigilance, alarm systems.
Beaton, 1997	USA (FF *n* = 1,730) (para *n* = 253) CIs		Occupational stress, symptoms of stress	Direct path between rated social support at work & job dissatisfaction; occupational stress & job dissatisfaction. Indirect influence on stress symptoms operating through appraisal of occupational stress.
Beaton, 1998	USA (*n* = 173) CIs		Stressor ratings	Catastrophic injury to self/co-worker; gruesomeness; helping seriously injured, vulnerable victims; minor injury self; death/dying exposure.
Beaton, 1999	USA (*n* = 220) mixed FF/Para CIs			Years of service and past 6 month exposure not predictive. No protective coping style found. Cognitive behavioural avoidance & numbing predicted symptomatology at 6 months.
Beaton, 2004	USA: (*n* = 261) 9/11	Caseness > 40% but did not persist > 1 month		Avoidance & intrusion secondary response symptoms spiked one week post 9/11.
Berninger, 2010a	USA (*n* = 10,074) 9/11	Yr 1: 9.8% Yr 4: 10.6%		Earliest arrival & prolonged work at site, supervising without previous experience, retirement due to WTC disability for elevated

				PTSD risk. For each additional death in firehouse, corresponding 10% increase in odds of elevated PTSD risk. Exposure-response gradient in each year for symptoms & decreased functioning. Increase in counselling use & alcohol use associated with elevated risk.
Berninger, 2010b	USA (*n* = 5,656) 9/11	Post 9/11: 15.5% probable PTSD at both times. Baseline: 8.6% 2.9 Yrs: 11.1% 44.5% of all probable = delayed onset	Alcohol use Functional impairment: baseline 15.2%	PTSD associated with functional impairment. Increased alcohol use associated with probable PTSD. At baseline predictor of delayed onset. On multivariate, increased alcohol use borderline for delayed onset. Delayed onset longer exposure, younger, increased alcohol use baseline. Increased alcohol use 2.2 times more likely if had PTSD at follow-up when no alcohol increase at baseline.
Boxer, 1993	USA (*n* = 145) CIs		Psychological distress: 33-41% Alcohol problems: 29%	Higher levels of distress where stressful worker-supervisor relationships. No work stressor entered multiple regression model for distress or alcohol.
Brown, 2002	N. Ireland (*n* = 248) CIs including acts of terrorism		Psychological distress	With lower exposure, emotion-focused coping and external locus of control associated with less distress but task focused when greater exposure & no locus of control association. Most distress associated with avoidance coping. Coping mediates association between locus of control & distress.
Bryant, 1996	Australia (*n* = 651) CIs	26%		No specific predictor by event type. Association with multiple & recent CIs. Helplessness associated with PTSD. Senior

				ranks feared more for others, junior for being burned or trapped.
Bryant, 2005	Australia (*n* = 82),trainees and 6 months after operational (*n*= 68) CIs	Time 1: 0% Time 2: 0%	Posttraumatic stress	Maladaptive appraisals of self (catastrophic thinking) at Time 1 predicted posttraumatic stress CAPS total score at T2.
Bryant, 2007	Australia (*n* = 52) CIs	4 years: 12%	Depression	Negative self-appraisals pre-trauma only variable to predict PTSD, but did not predict depression.
Bryant, 2007	Australia (*n* = 60) CIs	4 years: 16%	Depression	Deficit in memory retrieval prior to exposure associated with post exposure levels of posttraumatic stress.
Chamberlin, 2010	Australia Recruits (*n* = 42) On shift (*n* = 51) Fatal attendance (*n* = 52)	 14% 10% 13%		Higher distress associated with age, years of service & rank, but age only independent on regression. Social support associated with lower distress.
Chang, 2003	Taiwan (*n* = 84) Earthquake rescue	21.4%	General psychiatric morbidity 16.7%	Longer job experience highest risk for both. Contact with dead related to both. Distancing, escape-avoidance & positive reappraisal predictors of posttraumatic stress.
Chang, 2008	Taiwan (*n* = 193) Earthquake rescue		Posttraumatic distress	Older age & job experience > 3 yrs associated with both. No coping strategy buffered effect of exposure to dead on PTSD.
Chen, 2007	Taiwan (*n* = 410) CIs	5.4%	Depression: 10.5% Alcohol abuse: 53.65% Quality of life	Poor quality of life predicted by major depression, PTSD & sleep disturbance + psychosocial factors e.g. marital discord, work overload & criticism + perceived physical condition.

Chiu, 2011	USA (*n* = 1,925) Retired, 9/11	6% 16-22% elevated risk		Early arrival time associated with highest psychopathology. Younger and those with disability pensions significantly higher scores.
Cook, 2013	Australia Review literature			
Corneil, 1999	USA (*n* = 203) Canada (*n* = 625) CIs	22% 17% (difference NS)		USA married and line service protectors, Canada not. USA supervisory rank associated, Canada not. Canada years of service associated, USA not. Both work strain variable and prior history of help/counselling associated with higher odds.
Corrigan, 2009	USA (*n* = 8487) 9/11	12% elevated PTSD risk	28% self-reported to CSU	CSU use, functional impairment, mental health-related medical leave associated with elevated risk. Highest rates for presence during collapse and self-reporting loss of colleague at collapse. Lower rates of PTSD & CSU use + mental health leave as FDNY tenure increased.
Dean, 2003	Australia (*n* = 143) Career Auxiliary CIs	 Sig: 9.3% Extreme: 13.3% Sig: 4.5% Extreme: 4.5%	Psychological distress: severe – 12.7%	Career scored higher on IES than auxiliary, but only years of service associated with psychological distress.
Del Ben, 2006	USA (*n* = 131) CIs	5-8%		Previous psychological treatment, age work began, miscellaneous calls & horror following single worst event.
Farnsworth,	USA (*n* = 225)			Fear of emotion strongest predictor; negative

2011				social interaction also associated (positive social support protective), but both forms moderated by fear of emotion.
Fullerton, 1992	USA Sioux City disaster response (*n* = 12) NYC special unit (*n* = 8) Qualitative			Helplessness, guilt, fear of unknown, physiological reactions, identification with victim. Social support, leadership type, training level, rituals mediated.
Guthrie, 2005	Australia (*n* = 87) CIs Trainee After exposure			Physiological reactivity pre-exposure predictive.
Harris, 2002	USA (*n* = 660) CIs		Coping skills; traumatic stress reactions	No evidence of contribution of CISD.
Haslam, 2003	UK (*n* = 31) CIs	6.5% (not work related)		Rumination, trouble sleeping, distressing dreams, flashbacks, sensitivity to smell, helplessness, identification with victim, children, organisational factors. Relied on partners for support. Humour important coping strategy.
Heinrichs, 2005	Germany (*n* = 43) CIs Baseline 24 months	 0% 16.3%	Depression, anxiety, general psychiatric morbidity, global symptoms severity, alexithymia	High hostility & low self-efficacy at baseline most predictive. Strongest increase in symptoms 6-12 months (high exposure).
Hill, 2009	UK (*n* = 6) One CI including fatality of watch member	100%		Avoidance, numbing, helplessness, guilt reported. Social support from watch preferred coping mechanism.

	Qualitative +			
Jacobsson, 2014	Sweden (*n* = 180) Qualitative			Stressful Cis included persons trapped & multiple victims in RTCs; large fires, resource issues, organisational issues; threat to life & safety. Gender differences noted in descriptions.
Jeanette, 2008	Canada (*n* = 142) CIs Scenario based			Informal discussion uniformly highly rated. Moderate severity CIs one-to-one; highest severity one-to-one & CISD endorsed.
Kalimo, 1980	Finland (*n* = 260) female alarm operators (*n* = 6)		Stress, depressive & avoidance symptoms	Work at alarm centre & ambulance service more of a burden than traditional firefighting tasks. Mostly organisational factors including shift work. Chronic psychological problems uncommon.
Lee, 2014	Korean (*n* = 522)	NR		Association between number of TEs and level of perceived stress. PTSD symptomatology influenced positively by perceived stress, not work related stress. Effect of TEs on symptoms via perceived stress weaker where highly resilient.
Leykin, 2013	Israel (*n* = 65) Carmel fire disaster	12.3 – 18.5% depending on cut-off score		>⅓ reported helplessness. Mean intrusion score significantly higher than others on IES-R. Significant relationship between PTS and PTG. PTG in personal strength & appreciation of life.
Lougassi, 2012 (reported by Rebacz)	Israel (*n* = 300) Control FFs	24% 5%		Low self-efficacy, repeated exposure to TEs.
Malek, 2010	UK (*n* = 436) Malaysia (*n* = 617)		Occupational stress, depression, anxiety	UK FFs high levels of depression compared to anxiety & stress. 'Foster positive attitude' most used for UK; 'cognitive positive self-talk'

				for Malaysian. Overall coping did not influence psychological wellbeing in UK FFs but did in Malaysian; & overall coping did influence job satisfaction in UK FFs but not in Malaysian.
McFarlane, 1987; 1988; 1989	Australia (*n* = 469) Bushfire 1987		Psychological distress 23.2-30%	Only 9% of variance explicable by disaster and life events (which have independent relationships with psychiatric disorder). Past & family history of psychopathology, not exposure related.
	1988 (8 months later) (*n* = 50)	22%		At all 3 stages pre-morbid vulnerability accounted for a greater percentage of variance than disaster. Neuroticism & past history of treated psychiatric disorder predicted.
	1989 4, 11, 29 months (*n* = 469)			
McFarlane, 1992;1998	Australia (*n* = 469)	29 months 13.4%	Alcohol	PTSD significantly associated with alcohol misuse. In those with PTSD, alcohol consumption was either discouraged or increased in early stages.

Meyer, 2012	USA (*n* = 142)	4.2% - 6.4%	Moderate to severe depression: 3.5%; moderate to severe anxiety: 4.2%; probable alcohol misuse last year: (10.6%), lifetime 25.4%); problematic last year: 22.5%, lifetime 40.1%	Less education only individual predictor of alcohol misuse. No demographic/employment predicted any symptoms, including years' experience, race, marital status, rank, hours worked, military status. No exposure variable predicted. Lower scores on social support predicted higher composite scores. Higher occupational stress predicted higher composite scores. Higher self-blame predicted higher composite & alcohol scores. Higher substance use coping scores predicted higher composite scores and higher alcohol scores. Coping by seeking support from others not protective. Worst mental health outcomes for combination of low perceived social support and high levels of self-blame.
Milen, 2009	USA (*n* = 115)		Coping	All responses used fell below the means indicating that they lack coping resources to cope with stress.
Mitani, 2008	Japan (*n* = 128)	High risk 22%		Social support key factor.
Monteiro, 2013	Brazil (*n* = 27)	0%	Mild & moderate depression each 7.4%; moderate anxiety 3.7%; severe anxiety 3.7%; hazardous	Number of children in incidents correlated with depression and anxiety. Positive associations between years of service and age with alcohol misuse; and age with depression.

			drinking 22.2%; harmful drinking 3.7%.	
Moran, 1995	Australia (*n* = 747)		Stressful callouts	Positive: exhilaration; job well done; appreciation of life & colleagues; sense of control. Role of humour unclear. Negative included rumination & thought suppressors less likely to report exhilaration.
Moran, 1998	Australia (*n* = 747)		Stress	Highest in middle experience group.
Moran, 1999	Australia (*n* = 39) CIs Recruits Experienced controls		Stressful callouts prediction by recruits	Anticipated exhilaration greater than for controls. Ratings for positive reactions higher than controls and increased. No relationship between humour and positive reactions.
Moran, 2001	Australia (*n* = 37) CIs Recruits			Recruits predicted stressful nature of certain events significantly lower than experienced FFs in 1995 study.
Morren, 2005	Netherlands Explosion Deployed (*n* = 246) Non-deployed (*n* = 71)	0.9%	Anxiety, depression, hostility & sleeplessness	Deployed and non-deployed quite comparable in health. When deployment alone unrelated to health problems, disaster-related experiences predicted PTS symptoms. Most reliable predictor work-related distress and personal.
Murphy, 2004	USA (*n* = 73) CIs 6 months prior 9/11 Vicarious exposure 1 week post 9/11	Frequencies not given	Occupational stress; social support	Worry re: team competence associated with IES after, not before 9/11 & occupational personal safety more so after.
North, 2002	USA (*n* = 181) Oklahoma City bombing Volunteer	13%	Alcohol: Post-disaster 24% Lifetime 47%	Lower PTSD than victim survivors may reflect less injuries and training etc. Alcohol disorders endemic before bombing.

North, 2002	USA (*n* = 181) Oklahoma City bombing Volunteer	13%	Functional impairment 83% of PTSD sufferers	Exposure to children's remains/loss of loved ones not associated with impaired functioning. Impairment common in PTSD sufferers. May have been denial of symptoms. Coping most commonly through social support followed by alcohol use.
Nydegger, 2011	USA (*n* = 91) CIs	6.6%		Years of service associated with symptoms, not with positive coping. Self-distraction only negative form reported. Humour one of top 4 reported. Others acceptance, religion, positive re-framing. Negative association between positive emotional support & years of service.
Ogińiska-Bulik, 2007	Poland (*n* = 90)		Type D personality	Type D personality and maladaptive strategies associated with increased level of PTSD symptoms. Abstract only, article in Polish.
Ogińiska-Bulik, 2013 IES-R	Poland (*n* = 43) within mixed emergency responders (*n* = 226)	61.2% of total sample		Positive supervisory support predicted lower PTSD. Positive peer support & spirituality predicted positive growth.
Perrin, 2007	USA (*n* = 3,232) 9/11. Rescue & recovery workers	12.4%		Earlier start date and duration of time worked significant risk (except for police). Greatest risk for workers without training, or no training for task. If trained workers, within disaster experiences were risks. Identification may have been risk for FFs because of loss of life of comrades.
Prati, 2013	German (*n* = 701) and Italian (*n* = 623)		Perception of risk, acute stress reactions	Higher risk perception associated with higher perceived training, practical experience & acute stress reactions. Differences in

				perceived training and practical experience. Organisational factors important in risk prediction in FFs.
Psarros, 2008	Greece (*n* = 102) Wildfires	18.6% (11.8% seasonally employed)		Seasonally employed younger, high anxiety, little experience in disasters.
Regehr, 2000	Australia (*n* = 164) CIs	7% severe 68% moderate	Depression: 3% severe; 19.5% moderate	Years of service and officer rank mildly associated with distress. Lack of control & alienation from others associated with depression and PTS symptoms. PTS not associated with operational support, but with loved ones.
Regehr, 2003a	Canada Recruits (*n* = 65) Experienced (*n* = 58) CIs			Experienced significantly higher PTS & depression than recruits & lower social support. Support and length of time on job most significant for PTS & depression.
Regehr, 2003b	Canada FFs (*n* = 178) Paramedics (*n* = 86)	High on IES: 4.3%; severe: 15.9%	Moderate depression 1.9%; severe depression 0.8%	Involvement in formal post-mortem reviews associated with significantly higher PTSD & depression. Most stressful internal, next coroner's inquest. Length of review significantly associated only with PTSD & sole predictor on regression.No differences in alcohol/substance abuse, but those in reviews significantly more likely to take mental health stress leave after event. Media coverage of event & review not associated to PTSD but coverage of event associated with depression. Self-control & self-efficacy associated with depression, not PTSD & control strongest predictor of depression on regression.

				Support loved ones & employer associated with PTSD and with depression. If involved in review, increased perception of union support.
Regehr, 2009	Australia (*n* = 10)			Combination of quantitative & qualitative results indicates risk of social support network degenerating over course of career.
Riolli, 2012	USA 9/11 (*n* = 50) CIs (*n* = 52)			Personality variables buffered the effect of exposure to CIs, but not to 9/11 response. As hope increased, so did the symptoms in the 9/11 group.
Saijo, 2008	Japan (*n* = 1,301)		Depression and job dissatisfaction	Workload, conflict, low support from supervisors, role issue, low self-esteem.
Sliter, 2013	USA (*n* = 179) CIs		Burnout, absenteeism	Traumatic stressors predicted PTSD, burnout & absenteeism. Humour buffered symptoms but not absenteeism.
Tuckey, 2011	Australia (*n* = 547) volunteer		Traumatic stress symptoms, psychological distress, burnout	CIs associated with TSS, partially mediated by emotional demands. Camaraderie protective against poor psychological health, with its greatest effect when emotional demands were at their highest.
Varvel, 2007	USA (*n* = 53)		Perceived stress	Higher supervisory support associated with lower stress. Peer support had curvilinear relationship as low support associated with stress, but if above the median, no such effect.
Wagner, D., 1998	Germany (*n* = 402)	18.2%	Mental disorder 27% Substance misuse 19%	Greater experience and number of TEs in last month.
Wagner, S., 2009	Canada (*n* = 94) Controls (non-FFs) (*n* = 91)		Traumatic exposure on world assumptions	No difference from controls on self-worth, world meaningfulness, world benevolence.

Wagner, S., 2010	Canada (*n* = 185) FF (*n* = 94) Non (*n* = 91)	Neuroticism significant predictor. Years of experience no association.
Wagner, S., 2011	FF (*n* = 94) Non (*n*= 91)	Factor analysis of IES-R showed no support for three factor subscales' use in firefighter studies.
Wagner, S., 2012	Canada (n=167) Volunteer FF (*n* = 64) Non (*n* = 103)	PTSS higher for volunteers. Neuroticism predictive of mental health issues, but not PTSS.