Hyperarousal: the Critical Determinant of Post-Trauma Sequelae

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By

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iv. Abstract

Background

Recent literature has revealed the prognostic role of the hyperarousal criteria as a predictor of further PTSD symptom onset, maintenance, and severity. Despite this, there is a distinct gap in the literature as to the aetiology of hyperarousal, and the impact of these symptoms on an individual's post-trauma sequelae outside of the PTSD paradigm.

Aims

This thesis examined hyperarousal in the context of post-trauma sequelae. Specifically, the chapters of this thesis focus on which trauma-related factors predicted this criterion following a traumatic experience; the role of hyperarousal in the development of psychological disorders other than PTSD; how hyperarousal affects an individual's quality of life and disability level following a trauma; and finally, delineating the relationships between the individual symptoms of hyperarousal as they manifest longitudinally following a traumatic event.

Method

Such a breadth of analysis required the use of data from three very distinct epidemiological data sets. The Military Health Outcomes Program (MILHOP) of research, designed to establish the prevalence of mental disorder and psychological distress in currently serving Australian Defence Force (ADF) personnel, was utilised to assess how different aspects of trauma (i.e. the nature and number of traumas) predict the onset of hyperarousal. The South East Lifetime Impact of Fire Exposure Study (SE LIFE) a longitudinal study of individuals exposed to the Ash Wednesday Bushfires of February 16th, 1983, was utilised to assess whether hyperarousal significantly predicted novel episodes of disorder other than PTSD. Finally, the Injury Vulnerability Study (IVS), a

large-scale national multisite study of psychopathology following traumatic injury, was utilised to assess both the impact of hyperarousal on quality of life and disability following trauma and how the symptoms of hyperarousal manifest longitudinally following a traumatic event.

Results

Highlighting the significant association between cumulative trauma and the development of hyperarousal, the results presented in this thesis also emphasise the role of hyperarousal criterion in the prediction of both future episodes of PTSD and other anxiety and affective disorders. An examination of the contributions of the different symptom criteria of PTSD in predicting quality of life and disability following trauma highlighted the role of hyperarousal in particular predicting poorer physical and environmental self-reported quality of life and increased disability. A closer examination of the relationships between the symptoms of hyperarousal following a traumatic experience illustrated the significant role that hypervigilance plays in promoting further symptom recruitment within this criteria and perhaps the disorder.

Conclusion

The results presented in this thesis highlight the significant role of the hyperarousal criteria post-trauma. Significantly influenced by both the nature and number of traumas experienced, hyperarousal has a prominent role in post-trauma sequelae, predicting future novel episodes of disorder, poorer quality life and an increased level of disability. Suggestions for trauma interventions include early-targeted treatment of hyperarousal symptoms, particularly hypervigilance, which was shown to predict the onset of further hyperarousal symptoms. Future research should focus on expanding the paradigm of hyperarousal and providing a better understanding of the neurological and biological

underpinnings of these symptoms, which play a critical role in critical determining post-trauma sequelae.

v. Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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Jason Blunt

I believe that this thesis is properly presented and conforms to the specifications for the degree of sufficient standard to be, prima facie, worthy of examination

Professor Alexander Cowell McFarlane

Principal Supervisor

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1. Background and Introduction

1.1. Commentary

The hyperarousal symptom criterion comprises five symptoms that have often been studied individually, in the context of both PTSD and other psychological disorder. Despite each symptom not being specific to PTSD, the hyperarousal criterion has been found to be significantly associated with the development of PTSD symptomology post-trauma. Despite this, little research has focused on the wider outcomes of meeting this criterion of symptoms post-trauma.

This thesis begins by exploring the existing PTSD and trauma literature with regards to this distinct criterion, identifying significant research questions and hypothesis. The aim of this introduction is to provide the reader with the background literature and reasoning behind the hypothesis which form the basis of the following chapters of this thesis

By the end of this chapter, the reader will understand why this thesis focuses on investigating; 1) what trauma experiences drives hyperarousal onset; 2) how meeting hyperarousal impacts both the presentation of PTSD and other psychological disorder; 3) how hyperarousal impacts on functional outcomes post-trauma; 4) and how this distinct criteria manifests following a traumatic experience. In answering these questions in the context of the previous psychological and psychiatric literature, this thesis provides a deeper understanding of the clinical importance of these symptoms and their relevance to both the survivors, and the individuals who treat and care for them post trauma.

1.2. Background

In the latest edition of the Diagnostic and Statistical Manual of Mental Disorders version 5 (DSM-V), Post-Traumatic Stress Disorder (PTSD) is defined as 'a Trauma and Stress or Related Disorder that results from an individual's inability to cope with a traumatic occurrence' (American Psychiatric Association, 2013). The exposure, triggered by either a direct experience, witnessing the event, learning of trauma to a loved one or family member, or repeated first hand exposure to or extreme exposure to adverse details of a traumatic event, must cause clinically significant distress or impairment for the individual (American Psychiatric Association, 2013). Specifically, an individual must present with at least; one symptom of intrusive recollection (dreams, flashbacks, memories), one symptom of avoidance (avoiding specific reminders or stimuli, both internal and external), two symptoms of negative alterations of mood (emotional numbing, detachment, loss of interest, feeling a shortened sense of future) and two symptoms of hyperarousal (difficulty sleeping, concentration problems, increased anger or irritability, reckless or self-destructive behaviour, increased startle response and hypervigilance) (American Psychiatric Association, 2013). Further, these symptoms must be present for a month following trauma and must cause significant functional impairment for the diagnosis to be met (American Psychiatric Association, 2013). The introduction of the DSM-V also saw two specifiers of PTSD being introduced; with dissociative symptoms, whereby an individual presents with either depersonalisation or derealisation; and with delayed expression, whereby full diagnostic criteria is not met until at least 6 months after the event (although the onset and expressions of some symptoms may be immediate) (American Psychiatric Association, 2013).

Worldwide studies estimate lifetime rates of PTSD in the general population range from 5% to 10% and suggest that approximately 60% of these cases become chronic

(symptoms lasting three months or longer) (American Psychiatric Association, 2000; Slade, Johnston, Oakley Browne, Andrews, & Whiteford, 2009; Stein, Walker, Hazen, & Forde, 1997; Yehuda et al., In Press). Much research has either implicitly or explicitly regarded PTSD as comprising a single, underlying construct of post-trauma suffering, which has led to the use of a single index that aggregates measurement of symptom severity across clusters (Schell, Marshall, & Jaycox, 2004). However, the literature is now leaning towards a multi-dimensional and dynamic perspective on PTSD whereby symptoms both increase and decrease over time, thus changing presentation longitudinally (Solomon, Horesh, & Ein-Dor, 2009).

1.3. PTSD Diagnosis and Diagnostic Criteria

Historically, PTSD has been known by a variety of monikers, including shell shock, battle fatigue, combat stress reaction and war neurosis (Newport & Nemeroff, 2000). Whilst an argument can be made that the earliest classification of PTSD came in the first edition of the Diagnostic and Statistical Manual of Mental Disorders in 1952, when the term 'Gross Stress Reaction' was coined under the classification of Transient Situational Personality Disorder, the modern understanding of PTSD was formulated in the 1970s, as a result of the problems facing veterans returning from the Vietnam War. The American Psychiatric Association (APA) officially added PTSD as a separate entity to the third edition of its Diagnostic and Statistical Manual of Mental Disorders (DSM-III) in 1980. Posttraumatic Stress Disorder was initially defined in DSM –III as a severe reaction to a stressor that must be so severe that it would produce significant symptoms in almost anyone, as it was so outside the range of normal human experience, whether it be physical, psychological or both. The symptoms were divided into three categories: re-experiencing (including dissociative-like states), numbing of responsiveness, and cognitive or autonomic symptoms, whose onset could be either acute or delayed. The revised edition of the manual (DSM-III-R) in 1987 broadened the definition of the

stressor, removing the requirement that the stressor must be so severe as to produce symptoms in almost anyone. Instead, the new criteria emphasized the psychological nature of the stressor and minimized physical components, further expanding the range of symptoms to include a stronger emphasis on dissociation, and eliminating the acute form of the disorder.

The introduction of the DSM-IV in 1994 further refined the diagnostic criteria for PTSD. It now included a history of exposure to a traumatic event and symptoms from each of three symptom clusters: intrusive recollections, avoidant/numbing symptoms, and hyperarousal symptoms, which now required two or more of the following four criteria to be met; difficulty sleeping, irritability, concentration difficulties, hypervigilance and increased startle response. A fifth criterion was added which stipulated a minimum duration of symptoms (1Month); and, a sixth criterion stipulated that PTSD symptoms must cause significant distress or functional impairment. The definition of the now Criterion A, the stressor, was also further modified. It was expanded so that the stress was no longer limited to one experienced by the patient himself; it could be "*a threat to the physical integrity of self or others*". This was important as PTSD could now be diagnosed in individuals whom had not only directly experienced a trauma, but also in individuals who had been traumatized by the events that occurred to a loved one or significant other.

The newest revision, the DSM-5 published in 2013, has made a number of notable revisions to PTSD diagnostic criteria. First, PTSD was expanded to include anhedonic/dysphoric presentations, which are most prominent. Such presentations are marked by negative cognitions and mood states as well as disruptive behavioural symptoms (e.g. angry, impulsive, reckless and self-destructive) (American Psychiatric Association, 2013). Further, PTSD is no longer categorized as an Anxiety Disorder, but is

now classified in the newly created category Trauma and Stressor Related Disorders, in which the onset of every disorder has been preceded by exposure to a traumatic or otherwise adverse event (American Psychiatric Association, 2013). Hyperarousal in DSM-V saw the addition of a new symptom, reckless or self-destructive behaviour. Patients still only require two of the now six symptoms in the criteria to meet hyperarousal (American Psychiatric Association, 2013).

For the purposes of this thesis, DSM-IV criteria of PTSD was utilized, as all data was collected using measures that were created when this criteria was the current paradigm. As such, in this thesis, PTSD is defined in the previous context of being an anxiety disorder that results from an inability of an individual's schema to cope with a traumatic occurrence (American Psychiatric Association, 2000). Typified by the threat of injury or death to the individual or a loved one, and accompanied by intense fear, helplessness or horror, diagnosis is reached if three categories of symptoms are met (American Psychiatric Association, 2000). Specifically, an individual must present with at least; one symptom of intrusive recollection (dreams, flashbacks, memories), three symptoms of avoidance or numbing (emotional numbing, detachment, loss of interest, feeling a shortened sense of future or avoiding specific reminders or stimuli) and two symptoms of hyperarousal (difficulty sleeping, concentration problems, increased anger or irritability, increased startle response and hypervigilance) (American Psychiatric Association, 2000). Further, these symptoms must be present for a month following trauma and must cause significant functional impairment for the diagnosis to be met (American Psychiatric Association, 2000).

1.4. Defining hyperarousal (criterion D)

The hyperarousal symptoms, which comprise one of the three core criteria of PTSD, have become increasingly identified as critical indicators of post trauma dysregulation,

which results in dysfunction through a lack of engagement to surroundings with any zest or energy (Van der Kolk, 2004). The presence of hyperarousal symptoms can inhibit natural cognitive processes, whereby previously uncomplicated activities such as reading, conversing and watching television, through the process of fear sensitisation (see section: neurobiology of PTSD and hyperarousal), suddenly require concerted effort and selective attention (Van der Kolk, 2004). In this way cognitive dysregulation results in a lack of proper engagement with the environment, often leading to maladaptive patterns of social functioning that have been widely noted as core expressions of PTSD suffering (Frueh, Turner, Beidel, & Cahill, 2001). This can include but is not limited to interpersonal violence, social anxiety and avoidance, marital/family discord and occupational impairment (Frueh et al., 2001). However, despite recent literature evidencing a relationship between the hyperarousal criterion, psychological distress and further PTSD symptomology (Marshall, Schell, Glynn, & Shetty, 2006; Schell et al., 2004; Solomon et al., 2009), specific evidence for the development, course and outcomes related to this symptom cluster is lacking.

This thesis focuses on hyperarousal as the critical determinant of post-trauma sequelae. Therefore, this literature review will provide a comprehensive overview of the existing paradigms relating to hyperarousal within the psychological and psychiatric literature, to establish what exists, the gaps and omissions, and what the state of evidence is regarding hyperarousal as a critical determinant of PTSD sequelae including symptom presentation, severity, maintenance and poorer long term outcomes (Marshall et al., 2006; Pietrzak et al., 2013; Schell et al., 2004; Solomon et al., 2009). Before discussing this literature, however, it is important to have a basic understanding of the neurobiology of PTSD and theories of sensitisation, which are suggested to be at the core of hyperarousal onset and maintenance over time.

1.5. Understanding the phenomenon: the neurobiology of PTSD and hyperarousal

PTSD is associated multiple biological processes, influencing brain circuitry and neurochemistry, as well as cellular, immune, endocrine and metabolic systems (Newport & Nemeroff, 2000; Yehuda et al., In Press). The neurochemical reactions produced by stress in the brain are hypothesised to result in the development of hyperarousal symptoms (Weber & Reynolds, 2004). These neurochemical reactions include increased regional norepinephrine, locus coeruleus neuron responsiveness, dopamine and endogenous opiate release, elevated glucocorticoid levels, and decreased density of benzodiazepine and opiate receptors (Weber & Reynolds, 2004). Whilst these reactions have been empirically linked to the flight and fight response, how these reactions cause specific individual symptoms of hyperarousal, or whether these symptoms manifest as by product of these reactions, is unclear.

A number of neurotransmitters and neuropeptides have been linked to the hyperarousal symptoms of PTSD. Corticotropin-Releasing Factor (CRF) a peptide hormone that as a neurotransmitter is primarily involved in stimulating the production adrenocorticotropic hormone (ACTH), and thus increased synthesis of cortisol, has been linked to increased startle reactivity and hyperarousal symptoms (Dunlop et al., 2014; Elharrar et al., 2013). Norepinephrine (NE), from the family of catecholamine's derived from the amino acid tyrosine, is a principal mediator within the Central Nervous System (CNS) and autonomic stress responses. In the flight or fight response, NE increases alertness, arousal, and vigilance, increases memory formation and retrieval, increases heart rate and blood pressure and promotes restlessness and anxiety. Increased NE within the CNS has been linked to increased hyperarousal symptoms e.g. increased

startle response in both animal and human studies of PTSD (Ronzoni, del Arco, Mora, & Segovia, 2016; Yamamoto, Shinba, & Yoshii, 2014).

Altered production of the neurotransmitter Serotonin (5-HT) has also been linked to symptoms of hyperarousal, particularly hypervigilance and increased startle (Heim & Nemeroff, 2009). Playing roles in the regulation of sleep, appetite, sexual behaviour, aggression and impulsivity, motor function, and neuroendocrine control, Serotonin has also been implicated in the pathophysiology of mood and anxiety disorder and the modulation of stress responses. The findings of an epigenetic study of polymorphisms as predictors of trauma response to mild physical injury suggested that hypoactivity in serotonergic neurons may result in more severe hyperarousal studies (Sayin et al., 2010).

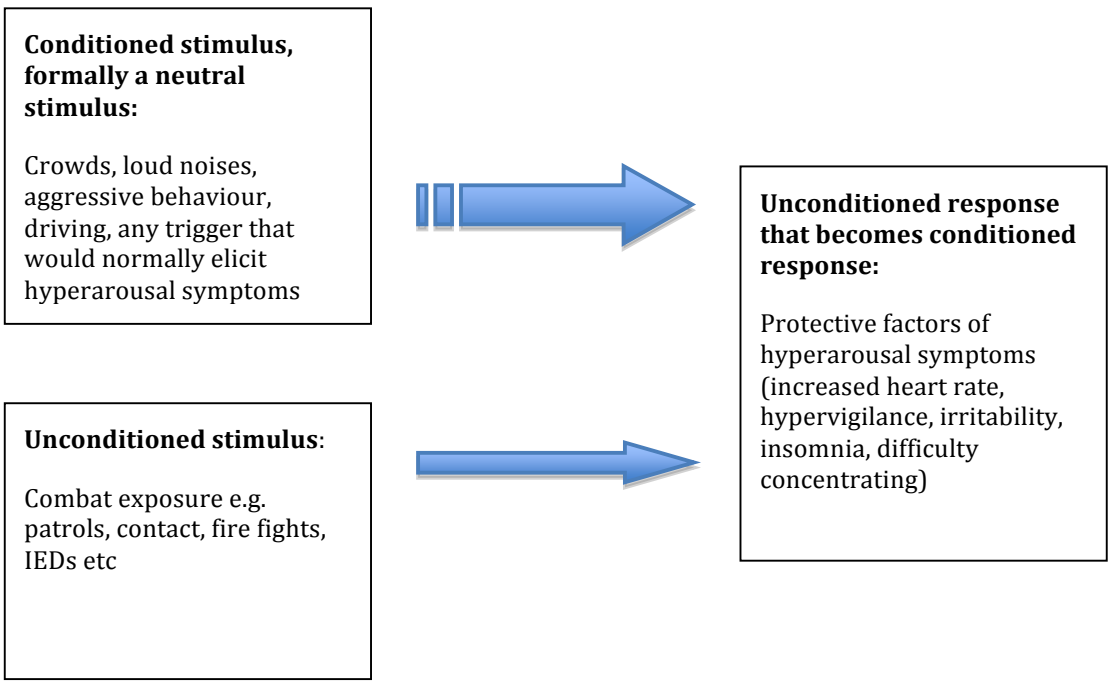
Epigenetic studies of PTSD suggest that environmental changes, such as exposure to extreme stressors, trigger biological responses at the genetic level, with changes to gene expression profiles altering biological and neuronal functioning (Rampp, Binder, & Provençal, 2014; Uddin et al., 2010). Studies into epigenetic change and regulation have attempted to provide insight into the relationship between genetic sequence variants (or polymorphisms) and psychiatric disorder. Specific genetic variants have been shown to predict PTSD is those exposed to extreme traumatic events such as natural disasters and those with a history of childhood abuse (Binder et al., 2008; Kilpatrick et al., 2007). Despite these promising findings, it is not yet understood at to whether these changes are adaptive or maladaptive, and even the result of pre-existing changes that alter the impact of the trauma on the individual (Rampp et al., 2014). More research is required to full understand the functional role these genetic variants play in the manifestation of PTSD and its specific symptom criteria such as hyperarousal.

The inability of those with PTSD to fully engage in their current environment and to effectively distinguish between what is threatening and safe is postulated to result from alterations to a variety of filtering systems in the central nervous system (Etkin & Wager, 2007; Pitman et al., 2012; Van der Kolk, 2004). These alterations can begin in the parietal lobes, where information from a variety of cortical areas is integrated, with the hyperactivity and greater activation in response to trauma stimuli associated with PTSD (Etkin & Wager, 2007; Sartory et al., 2013). The amygdala then analyses information for emotional significance, playing a crucial role in the detection of threat, fear learning and expression, and encoding the memory of traumatic events (which in the case of PTSD includes reminders of trauma) (Etkin & Wager, 2007; Liberzon et al., 1999; Pitman et al., 2012). The hippocampus then categorises the experience, by encoding environmental cues and episodic memories, then signalling the corpus callosum, which in turn transfers information from both brain hemispheres allowing the individual to integrate both emotional and cognitive aspects of the experience simultaneously whilst being amplified and/or filtered by the cingulated gyrus (Pitman et al., 2012; Van der Kolk, 2004). Finding from neuro-imaging studies of hippocampul activation in participants with PTSD have been mixed, however, more recent research suggests that PTSD may have a cumulative adverse effect in reducing hippocampul volume (Chao, Yaffe, Samuelson, & Neylan, 2014; Felmingham et al., 2009; Pitman et al., 2012). The pre-frontal cortex then becomes involved in the processes of problem solving, learning, and complex stimulus discrimination, specifically the planning, execution, inhibition and extinction of fear responses (Bremner, 2002; Pitman et al., 2012). Alterations to any of these brain regions can trigger the increase of involuntary associations between neutral stimuli in the present being perceived as linked to the traumatic event in the past (Pitman et al., 2012; Van der Kolk, 2004). These alterations trigger a pattern of hyperarousal, expressed by symptoms of hypervigilance, irritability, memory and concentration problems, sleep

problems and an exaggerated startle response (Fonzo et al., 2010; Pitman et al., 2012; Van der Kolk, 2004). This dysregulation is proposed to occur at the brain stem level, and includes the over activation of attentional systems controlled by the thalamus and the cerebral cortex (Pitman et al., 2012; Van der Kolk, 2004). Whilst the neurobiology of hyperarousal is not assessed further within this thesis, this summary provides an important context for the physiological basis of these symptoms, both the neurotransmitters involved, chemical reactions that are taking place, and the limbic regions that play host to these processes.

1.5.1. Animal models, sensitisation and kindling

Animal models utilising exposure of rodents to predator stress have replicated the fear provoking and intensity type model of PTSD to produce long lasting behavioural and physiological responses (Lapiz-Bluhm & Peterson, 2014; Myers & Davis, 2004; Siegmund & Wotjak, 2007). This predator stress mimics the brief intense life-threatening experiences that have long lasting affective consequences in human studies



(Lapiz-Bluhm & Peterson, 2014; Myers & Davis, 2004). Exposure to stress alone, however, does not sufficiently explain the psychological and physiological fear responses that persist long after the trauma exposure, that are characteristic of PTSD. Behavioural models of fear conditioning have been used to explain the phenomenon that underlies PTSD. An evolutionary adaptive response to stress or trauma involves the manifestation and consolidation of fear memories as a result of fearful situations, leading to the suppression and subsequent extinction of fear behaviours in safe situations. (Lapiz-Bluhm & Peterson, 2014; Myers & Davis, 2007; Peri, Ben-Shakhar, Orr, & Shalev, 2000). Fear conditioning, however, occurs when sensitisation and overgeneralisations take place, leading to a dysregulation of fear responses in non-threatening situations.

This process is best understood by examining Pavlovian models of fear conditioning. In this paradigm, a conditioned stimulus (CS; a stimulus that is initially neutral e.g. a light or tone) is paired with an aversive unconditioned stimulus (US; such as a mild electric shock) (Myers & Davis, 2007; Peri et al., 2000; Poulos, Long, Gannam, & Fanselow, 2015; Siegmund & Wotjak, 2007). After several pairings of the conditioned stimulus with the unconditioned stimulus, the subject exhibits a conditioned response (CR) of fear upon presentation of the CS (tone or light) such as a startle response or freezing (Lapiz-Bluhm & Peterson, 2014; Peri et al., 2000). This learned fear could be rendered extinct by repeated or prolonged exposure to the CS in absence of the US, which results in a gradual decline and loss of the CR. However, this extinction may not be permanent and is subject to reinstatement, renewal and spontaneous recovery (for more information regarding these paths please refer to (Lapiz-Bluhm & Peterson, 2014; Myers & Davis, 2007).

Through this conditioning and sensitisation process, previously neutral stimuli in the home environment are now equipped with the capacity to evoke conditioned responses (i.e. the hyperarousal symptoms). A key example is crowds, with which many military veterans struggle to cope, even after years have passed since their combat experiences (Kracen, Mastnak, Loaiza, & Matthieu, 2013; Satel, Becker, & Dan, 1993; Shatan, 1973; Ward, 1997). The conditioned responses of hyperarousal to the presence of large groups during combat, given the likelihood for them to be hostile, leaves veterans socially inept upon return to the 'real world' of supermarkets, bank lines and busy public areas, and can even present as a barrier to accessing care (Kracen et al., 2013; Mattocks et al., 2012). Other examples include cars backfiring (triggering the conditioned response to explosions or gunfire), aggression (both physical and verbal, direct or indirect) and movies that trigger hyperarousal symptoms such as increased heart rate or hypervigilance. Although common in military veterans due to the unique nature of combat exposure (the use of loud weaponry), this startle response is also common in individuals exposed to a range of other traumas including motor vehicle accidents, terrorist attacks, rape and fires (Guthrie & Bryant, 2005; Rothbaum, Foa, Riggs, Murdock, & Walsh, 1992; Shalev & Freedman, 2014; Shalev et al., 2000).

The key regions of the brain associated with fear-related processing and behaviours are the hippocampus, amygdala, and the pre-frontal cortex (Lapiz-Bluhm & Peterson, 2014; F. G. Morrison & Ressler, 2014). Hyperactive amygdala activity is the hallmark of all fear-related disorders, particularly PTSD (El Khoury-Malhame et al., 2011; Lapiz-Bluhm & Peterson, 2014; Patel, Spreng, Shin, & Girard, 2012). The amygdala consists of the basolateral complex (critical in the acquisition, expression and extinction of fear) and the central nuclei (the host of fear output, that when activated sends messages to different regions of the brain that activate behavioural fear responses and symptoms) (Lapiz-Bluhm & Peterson, 2014).

The prefrontal cortex and the hippocampus play a critical role in modulating the activity of the amygdala. Activity in different areas of the prefrontal cortex are both positively and negatively correlated with activation of the amygdala, suggesting the prefrontal cortex is both inhibitory and facilitative of amygdala activation during the process of fear conditioning (Lapiz-Bluhm & Peterson, 2014; Pitman et al., 2012; S. J. Weiss, 2007). The hippocampus modulates amygdala activity by acting as a filter, regulating and monitoring, and discriminating stimuli during contextual learning and extinction (Lapiz-Bluhm & Peterson, 2014).

Research suggests that hyperarousal and subsequent reactivity may result from the activation of central and autonomic nervous system processes (Lapiz-Bluhm & Peterson, 2014; Pitman et al., 2012). Activation of the central nuclei of the amygdala leads to a projection of responses in a number of brain regions, including the basal forebrain (responsible for arousal, vigilance and attention) and the reticular pontis caudalis (increased startle response)(F. G. Morrison & Ressler, 2014).

More recent research has shown the basic fear conditioning and extinction models to be insufficient to produce the PTSD phenotype (Pitman et al., 2012). Newer models, such as predator exposure, exposure to a single prolonged stressor, and exposure to multiple stressors have attempted to gain construct validity by utilizing the increasing body of knowledge of the pathophysiology of PTSD (Lapiz-Bluhm & Peterson, 2014; Pitman et al., 2012). These models utilize more PTSD specific symptomology endpoints, such as abnormal fear learning, exaggerated acoustic startle response and startle habituation, enhanced glucocorticoid signaling and negative feedback inhibition, and an exaggerated autonomic nervous system (Pitman et al., 2012). Theories of sensitisation and kindling explain these changes in neural circuitry through the processes of fear conditioning and non-associative learning (Stam, 2007). In theories of sensitisation,

previous neutral stimuli provoke a defensive response after exposure to a traumatic event. If such stress responses are repeated and/or sustained, these responses cause change in an individual's homeostasis through allostatic load, which if not resolved in turn precipitates disease through sensitisation of the aforementioned systems within the nervous system (Pitman et al., 2012) . Despite vast research into the neurobiology utilising various animal models of PTSD, there is still relatively little known as to the etiology of PTSD in terms of neural processes and the breakdown of the neurology of individual PTSD symptom clusters. Whilst animal models and the theories of sensitisation and kindling are not explicitly expanded upon in further detail within this thesis, these models provide theoretical context as to how these symptoms develop following trauma, from both a physiological and behavioural context.

1.6. Delayed onset and sub-syndromal PTSD

One of the critical challenges that has faced the field of PTSD research is the observation that many individuals who appear well after a traumatic experience eventually become unwell (McFarlane, 2010). As discussed above, theories of sensitisation highlight how many individuals develop symptoms over time following trauma, as systems fail to adapt in response to either the initial experience, or subsequent stressors cause the further manifestation of symptoms (McFarlane, 2010). Research has shown that this process can take up to 6 months or longer to manifest as disorder, during which an individual's symptoms can either be absent or considered sub-threshold – where some symptoms are present but there are not enough present to reach full diagnostic criteria (Buckley, Blanchard, & Hickling, 1996; Smid, Mooren, van der Mast, Gersons, & Kleber, 2009). Delayed onset PTSD occurring in the presence of no previous symptoms is rare, and thus it is often characterised as the exacerbation of subclinical symptoms, or sub-syndromal PTSD, whereby a new stressful event reactivates or exacerbates previous symptoms of PTSD (B. Andrews, Brewin, Philpott, &

Stewart, 2007; Buckley et al., 1996; Carty, O'Donnell, & Creamer, 2006). Over-stimulation of stress hormones causing over consolidation of trauma memories (Pitman, 1989), subsequent reappraisal of trauma heightening the perception of threat (Ehlers & Clark, 2000), and/or the culmination of stressful events occurring after the initial trauma (Herrmann & Eryavec, 1994) have all been proposed as possible causes of delayed onset PTSD, however, the underlying mechanisms are still widely unknown (Bryant & Harvey, 2002; Smid et al., 2009).

Studies have found varying rates of delayed onset PTSD ranging from 10% (Solomon, Kotler, Shalev, & Lin, 1989) to 20% (McFarlane, 1988), with the former study also suggesting that 33% had an exacerbation of subclinical PTSD, which technically could have been considered delayed onset PTSD (B. Andrews et al., 2007; Buckley et al., 1996; Smid et al., 2009; Solomon et al., 1989). Carty, O'Donnell and Creamer (2006) concluded that sub-threshold symptoms should be considered a considerable risk factor for future PTSD diagnosis, a theory supported by a review by Andrews et al., (2007) which found that delayed onset PTSD accounted for, on average, 38.2% of military and 15.3% of civilian cases of PTSD. The presentation, and now more widespread acceptance, of the phenomenon of delayed onset PTSD highlights the need to evaluate data longitudinally, as it is clear that experiences throughout an individual's life may exacerbate previous symptoms and lead to the presentation of previously unidentified or latent symptomology or disorder (Horesh, Solomon, Zerach, & Ein-Dor, 2011). Given that sub-syndromal PTSD is so intrinsically linked to the phenomena of delayed onset PTSD, it may be possible to identify those at risk by retrospectively analysing the earlier symptoms of those who met criteria for PTSD in the later stages of a longitudinal analysis, such as those utilised in this thesis, to see whether unique symptoms of patterns of symptoms are driving the phenomena of delayed onset PTSD. In particular, the identification of those presenting with early symptoms of hyperarousal may be

indicative of future risk of disorder, a proposition that is discussed in the following section and later explored within the chapters of this thesis.

1.7. Why is hyperarousal a central construct in PTSD

Hyperarousal is central to the understanding of PTSD, not only as a construct within the monolithic diagnosis, but also by it's potential to be a key predictor of other clusters of PTSD symptoms (Marshall et al., 2006; Schell et al., 2004).

One of the first studies to postulate a potentially predictive relationship between hyperarousal and another symptom cluster of PTSD was conducted by Flack, Litz, Hsieh, Kaloupek and Keane (2000). The results of their study of 1,168 service-seeking or service-using Vietnam theatre veterans found a robust relationship between the hyperarousal cluster and the presence of emotional numbing, or Criterion C, in PTSD diagnosis (Flack et al., 2000). Three years later, Weems and colleagues (2003) further investigated the role of hyperarousal in predicting emotional numbing in children and adolescents with a history of interpersonal trauma. They found that hyperarousal symptoms predicted emotional numbing (score of 2 or more on the CAPS) both at the concurrent initial assessment and one-year follow-up, with hyperarousal associated with later emotional numbing, while emotional numbing *did not* predict later hyperarousal (Weems et al., 2003). Their findings support the proposal that emotional numbing may result from the exhaustion or depletion of cognitive and emotional resources due to a prolonged state of hyperarousal (Weems et al., 2003). Also noted in their results was the finding that hyperarousal was a strong predictor of other PTSD symptoms in addition to emotional numbing, although this was not expanded on within the scope of the article (Weems et al., 2003).

In a longitudinal study of the relationships between the three primary diagnostic criteria of PTSD (avoidance, hyperarousal and intrusion), Schell, Marshall and Jaycox

(2004) analysed a sample of 413 young adults who had suffered a significant physical injury as a result of community violence. Not only did they observe a strong direct influence of hyperarousal over both avoidance and re-experiencing longitudinally but they also reported hyperarousal to be the best single predictor of subsequent PTSD symptom severity. Interestingly, re-experiencing was also found to influence the other criteria, however the effect size was much smaller and was postulated by the authors to have resulted from the mediated effects of hyperarousal on re-experiencing than vice versa (Schell et al., 2004). Thus, because the influence of re-experiencing is as much a result of previous hyperarousal as it is previous re-experiencing, the authors asserted that the hyperarousal symptoms were the most significant predictor of all other symptom clusters within PTSD (Schell et al., 2004). Further, analysis of data from the 3 and 12 month follow ups showed that respondents for whom hyperarousal was the most prominent feature of their post-traumatic stress showed only minor improvements over the 12 months compared to those whose hyperarousal played a less substantial role in their initial post-trauma baseline (Schell et al., 2004) further suggesting a critical role of hyperarousal in maintenance of PTSD symptoms over time.

In a more recent study of 369 Israeli war veterans, hyperarousal symptoms at baseline predicted both re-experiencing and avoidance and numbing symptoms in both the one-year and twenty-year follow-up (Solomon et al., 2009). Thus the authors concluded that hyperarousal can be defined as the 'psychological engine' of PTSD which serves as a platform from which the other symptom clusters appear, and highlighted the need for research to focus on the individual symptom clusters of PTSD (Solomon et al., 2009).

This paper, together with the work of Schell et al (2004), and Marshall, Schell, Glynn and Shetty (2006), support the dominance of hyperarousal, compared to re-

experiencing and avoidance in predicting the later development of these same symptoms and therefore suggest that hyperarousal is a critical construct of PTSD (Marshall et al., 2006; Schell et al., 2004). As such, it is reasonable to hypothesise that the presence of hyperarousal symptoms even in the absence of these other symptom clusters may be a predictor of increased risk for PTSD symptom progression (Marshall et al., 2006). Taken together, the findings of these previous studies also suggest that Hyperarousal as a cluster has been found to have a significant predictive relationship with avoidance and numbing (Flack et al., 2000; Weems et al., 2003), (Schell et al., 2004) and to be an equal, if not more significant predictor, of both the re-experiencing and avoidance clusters than each of these individual criterions symptoms at previous follow-ups (Marshall et al., 2006).

Results of Schell Marshall and Jaycox's (2004) initial study was limited by the use of a mainly young adult, male, Hispanic sample that were exposed and injured in acts of community violence. Thus, as acknowledged within their discussion, more work is needed to see if their findings can be replicated in a sample of broader ethnicities, ages and trauma types (Schell et al., 2004). Marshall et al.'s, (2006) follow up study was also limited by a sample comprised predominantly of African American males exposed to interpersonal violence, with the authors acknowledgement that more work was required in samples including more female participants and those exposed to different types of trauma other than interpersonal violence (e.g. motor vehicle accidents or natural disasters) for their results to be generalisable. Despite these limitations, however, it is clear that hyperarousal plays a critical role in the course of post-traumatic distress and symptomology. What is missing from the current paradigm, however, is the generalisation of these findings to different populations of gender and trauma type, and also an identification of which specific aspects of hyperarousal (individual symptoms or

combinations of these symptoms) underlie these results (Marshall et al., 2006; Schell et al., 2004).

The dominance of Hyperarousal compared to the other two symptom clusters was observed as early as 2001, where Van der Kolk (2001)stated that in ‘‘an apparent attempt to compensate for their chronic hyperarousal, traumatized people seem to shut down-on a behavioural level, by avoiding stimuli that remind them of the trauma, on a psychological level, by emotional numbing, which may extend to both trauma-related and everyday experience (p.50).’’ Supporting this notion is the growing understanding of the biological nature of hyperarousal symptoms, (startle response has been shown to develop in the central amygdala, orbitofrontal cortex dysfunction is one suggested cause of hyperarousal symptoms, and elevations on the hypothalamic-pituary-thyroid axis were found to be correlated with the severity of hyperarousal symptoms), which in turn are related to other neurologic processes that may also predict other symptom clusters (Newport & Nemeroff, 2000; Pitman et al., 2012).

Supporting the conclusions made by Solomon and colleagues in 2009, this thesis proposes that hyperarousal requires further analysis both as a monolithic criterion and at the level of individual symptom contribution. There has been minimal effort in previous literature to examine the role of individual symptoms of hyperarousal in predicting PTSD diagnosis. One study of motor vehicle accident victims presenting with and without PTSD at one year post-trauma found that it was possible to detect subjects who later developed PTSD as early as one month after their initial trauma based on the severity of their sleep difficulties (Koren, Arnon, Lavie, & Klein, 2002). In a study of predictors of symptomatic distress in emergency services personnel exposed to traumatic critical incidents, hypervigilance was found to explain as much as 38% of the variance in PTSD (D. Weiss, Marmar, Metzler, & Ronfeldt, 1995). A more recent study by

Pietzrak and colleagues (2013) of 10835 World Trade Center responders into the dimensional structure and course of PTSD provided further insight into the role of symptoms of hyperarousal. Their results found that hypervigilance and exaggerated startle may primarily drive re-experiencing symptoms, and sleep difficulties, irritability and concentration problems may primarily drive emotional numbing symptoms over time (Pietrzak et al., 2013).

This research, combined with the findings discussed previously, highlights the need for a clearer understanding of hyperarousal post-trauma. Further delineation of the role that hyperarousal plays post trauma may assist in the identification of individuals at an increased risk of developing further post-traumatic symptoms (Pietrzak et al., 2013; Solomon et al., 2009). Clinically, the implication of such research is the possibility to develop therapeutic interventions which target an individual's initial arousal post-trauma, thus slowing or even preventing the development of further symptoms and ultimately preventing the onset of post-traumatic disorder and its associated implications for an individuals functioning and quality of life (Pietrzak et al., 2013; Solomon et al., 2009).

1.8. Predictors of hyperarousal symptom severity

Given the aforementioned centrality of hyperarousal to the development of other symptom clusters of PTSD, one can propose that determining what predicts hyperarousal is of both theoretical and clinical importance, particularly in relation to determining the causes and future treatments of PTSD. Despite recent research highlighting the value of investigating factors associated with predicting hyperarousal symptoms, currently this field of study is limited to literature that examines the risk factors and predictors of PTSD.

There are many established predictors of PTSD symptoms within psychological and psychiatric literature. Yehuda and LeDoux (2007), in a review of response variation following trauma, noted that event characteristics (the severity of the trauma) and individual differences (e.g. pre existing traits, pre-or post traumatic life events, individual coping styles) were the two most significant risk factors for PTSD development. Other notable risk factors covered in reviews of PTSD risk included a family history of psychopathology, individual cognitive factors (such as IQ), childhood adversity, avoidant personality or behavioural problems, and level of social support (Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2008; Yehuda & LeDoux, 2007). Despite the incomplete knowledge of the etiology and relative contribution of these risk factors to the development of PTSD, their presence constitutes an important source of variability in relation to individual response to trauma, including the development of subsequent hyperarousal symptomology (Yehuda & LeDoux, 2007). It is important to note that despite this research into the various risk factors for PTSD, no research has focused specifically on the risk factors associated with the individual symptom clusters of re-experiencing, avoidance and numbing, and hyperarousal, or the individual symptoms that comprise these clusters. The following paragraphs discuss some of the more pertinent risk factors for the development PTSD symptomology and in turn highlight the need for further evaluation of these risk factors in the context of hyperarousal symptomology.

1.8.1. Cumulative trauma

Multiple studies have established the important role of cumulative trauma exposure on the development and severity of PTSD. Cumulative trauma is associated with a greater likelihood of PTSD in adulthood (Cloitre et al., 2009; Karam et al., 2014; Schumm, Briggs-Phillips, & Hobfoll, 2006). Cumulative childhood trauma has been linked to more severe symptoms of PTSD and depression (Suliman et al., 2009), as well as with greater

adulthood disorder symptom complexity (Briere, Kaltman, & Green, 2008; Cloitre et al., 2009). Most studies focus on the role of cumulative trauma over an individual's lifetime, with many studies finding that those exposed to more traumas are at a greater risk for both a diagnosis of PTSD and more severe symptoms (Cloitre et al., 2009; Follette, Polusny, Bechtle, & Naugle, 1996; Karam et al., 2014; Krause, Shaw, & Cairney, 2004). Being exposed to multiple traumatic events is associated with greater severity and prevalence of PTSD, anxiety and depression (Breslau, Davis, Andreski, & Peterson, 1991; Karam et al., 2014; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Resnick, Kilpatrick, Dansky, Saunders, & Best, 1993; Suliman et al., 2009).

Providing support for the 'sensitization' model of PTSD (Post & Weiss, 1998) that is, greater responsiveness to subsequent stressors, frequently replicated epidemiological studies have found that the probability of being diagnosed with PTSD increases significantly if the person has a prior history of trauma. This has been observed in general population studies (Breslau et al., 1998), studies of military veteran populations (Douglas, 1993) and refugee studies (Finklestein & Solomon, 2009). As previous epidemiological studies have focused on the diagnosis of PTSD as a monolithic disorder outcome variable, it is currently unclear how previous trauma affects the development of *individual symptoms* of PTSD, such as the hyperarousal symptoms. The importance of this gap in current research cannot be overstated when considered in the context of what has been found by previous research as to the centrality of hyperarousal to the onset and maintenance of other symptoms of re-experiencing and avoidance and numbing (Marshall et al., 2006; Pietrzak et al., 2013; Schell et al., 2004). Determining whether previous trauma affects the onset of hyperarousal may provide potential clinical markers for both researchers and clinicians to determine those most at risk of future disorder.

1.8.2. Trauma type

The type, or the nature of trauma, has also been established as a significant predictor of PTSD symptoms (Breslau, Chilcoat, Kessler, & Davis, 2014; Breslau & Peterson, 2010; Ditlevsen & Elklit, 2012; Hetzel-Riggin & Roby, 2013; Shakespeare-Finch & Armstrong, 2010). In a sample of 715 traumatic injury survivors, Forbes et al (2012), divided trauma types into two specific groups, interpersonal trauma and non-interpersonal trauma, to examine differences in PTSD symptom profiles that may result from each trauma type. Finding that interpersonal traumas resulted in significantly higher scores of PTSD symptoms on the Clinician Administered PTSD Scale (CAPS) than non-interpersonal events, this study also found a greater rate of threat and fear response symptoms of PTSD, such as those symptoms found in the hyperarousal cluster (Forbes et al., 2012).

In a follow-up study, the same authors added a further categorical classification of trauma – intimate versus non-intimate interpersonal trauma. In this study, participants reporting intimate–interpersonal events were the most likely to endorse core symptoms of PTSD, including the hyperarousal symptoms of hypervigilance and increased startle response (Forbes et al., 2014). In summarizing their findings, the authors stated that the unique impact of interpersonal trauma on PTSD symptoms is related to a loss of trust in their surrounding environment, which is now viewed as unsafe and unpredictable due to the possibility of human threat due to their traumatic event experience. Thus, their two-part study established that, regardless of the nature of the perpetrator, experiencing an interpersonal event fuels a need for surveillance and vigilance for potential threat in the environment. Again, despite research finding the nature of the trauma being critical to an individual's outcomes post-trauma, no research has focused on how different types of traumas predict specific symptoms of PTSD, in particular hyperarousal, which could provide a theoretical basis for clinicians to tailor

treatment for specific symptom outcomes based on the nature of the trauma that has occurred to an individual. Thus this thesis will aim to explore how exposure to different trauma types predicts the onset of symptoms of hyperarousal.

Military studies provide further substantial support for the association between trauma type and PTSD, with the majority of such studies focussing on deployment and associated combat exposure (C. W. Hoge, Auchterlonie, & Milliken, 2006; C. W. Hoge et al., 2004; Renshaw, 2011; T. C. Smith et al., 2008b). Indeed, the aetiology of PTSD emerged from the original diagnosis of shell shock in World War 1. Following more modern campaigns, such as Operation Enduring Freedom (OEF) in Afghanistan and Operation Iraqi freedom (OIF) in Iraq, there has been significant research into the prevalence, consequences and risk factors for PTSD in personnel deployed to these areas of operation (Hermann, Shiner, & Friedman, 2012; C. W. Hoge et al., 2006; C. W. Hoge et al., 2004; C. W. Hoge, Terhakopian, Castro, Messer, & Engel, 2007; Milliken, Auchterlonie, & Hoge, 2007; Renshaw, 2011; T. C. Smith et al., 2008b). Several studies have reported on the number of pre-deployment factors that can influence the onset of PTSD in these veterans, including but not limited to, gender, divorce, history of family psychiatric illness, domestic violence, abuse, previous lifetime violence, rank, and pre-existing psychological or physical health conditions (Cabrera, Hoge, Bliese, Castro, & Messer, 2007; LeardMann, Smith, Smith, Wells, & Ryan, 2009; Phillips, LeardMann, Gumbs, & Smith, 2010; Sandweiss et al., 2011; T. C. Smith et al., 2009).

Deployment to combat zones has also been found to have a significant impact on PTSD. A cohort study of 774 deployed and 309 non-deployed soldiers, by Vasterling and colleagues (2010), found that deployment to Iraq was significantly related to increased PTSD scores on the Post-Traumatic Stress Disorder Checklist (PCL), and that combat exposure was associated with increased post-deployment PTSD symptom severity. Despite the finding of this study that deployment related stressors contributed to

longitudinal increases of PTSD symptoms (Vasterling et al., 2010), and the finding of a US military cohort study that combat exposures predict new onset and persistent symptoms of PTSD (T. C. Smith et al., 2008b), no literature has focused on how *different* deployment traumas uniquely predict the individual symptoms of PTSD, or the symptom clusters of PTSD directly. Whilst military populations are well versed in the occurrence and subsequent treatment of PTSD, further delineation of how different traumas predict unique symptoms and symptom clusters of PTSD would allow better screening of individuals post deployment, whereby the use of a simple deployment incident checklist could be used to determine their unique risk for specific symptoms and PTSD development. Previous research has evidenced greater rates of delayed onset PTSD in military cohorts (B. Andrews et al., 2007; Smid et al., 2009). Therefore the earlier identification of sub-syndromal symptoms and their negative impacts, such as hyperarousal leading to further development of PTSD symptomology (Marshall et al., 2006; Schell et al., 2004), is extremely important for these populations.

Previous research has identified a number of factors that can influence the onset and maintenance of PTSD. However, there is a clear gap in the current literature as to how different deployment and/or combat related traumas influence PTSD symptom recruitment and how these different traumas are related to the individual clusters of PTSD. Previous work on 4,762 UK military personnel who were deployed to Iraq has found that experiences involving the perception of threat to life and exposure to theatre operations outside an individual's prior experience was predictive post-traumatic stress symptoms (Iversen et al., 2008). Further studies by King and colleagues, of both Vietnam veterans (1999) and Gulf War veterans (2008) found that perceived threat played significant role in predicting PTSD and poorer aspects of health functioning. Finally, in 2010, Vasterling and colleagues found that post-battle experiences and perception of threat were associated with greater PTSD symptom increases compared to combat

exposures (Vasterling et al., 2010). As such, a key aim of this thesis is to address *how do different deployment and combat-related traumas impact the symptom presentation of hyperarousal?* Further, given the results of the aforementioned research, it was hypothesised that *traumas involving the perception of threat will be the strongest predictor of hyperarousal,* as these traumas result in a loss of trust in the surrounding environment (Forbes et al., 2014).

1.9. The relationship between hyperarousal and other psychological disorders such as depression/anxiety

Studies of large epidemiological cohorts have found that there is a high degree of comorbidity between PTSD and other psychiatric disorders such as depression and anxiety (Creamer, Burgess, & McFarlane, 2001b; Kessler et al., 1995). Such studies indicate that individuals with PTSD are highly likely (as much as 80%) to meet criteria for at least one other psychiatric disorder: in particular affective disorders, other anxiety disorders, somatisation, substance abuse, and dissociative disorders (Brady, 1997; Brady, Killeen, Brewerton, & Lucerini, 2000; Kessler et al., 1995; Kilpatrick et al., 2003). A substantial percentage have three or more other psychiatric diagnoses (Brady et al., 2000).

One postulated explanation for the large degree of comorbidity between PTSD and other psychiatric conditions is the large overlap between symptoms required to meet diagnostic criteria for each of these disorders. This is particularly prominent for the symptoms of hyperarousal. Sleep difficulties, for instance, are commonly reported by those suffering from major depression and anxiety, and are part of the diagnostic criteria for each of these disorders (Kilpatrick et al., 2003; Mellman, Bustamante, Fins, Pigeon, & Nolan, 2002; Sheikh, Woodward, & Leskin, 2003). However, the type of sleep symptoms found in these two disorders has been found to vary. In their assessment of

the convergence and divergence of sleep in PTSD and Panic Disorder (PD), Sheikh, Woodward and Leskin (2003) found that whilst sleep quality, episodic parasomnias (nightmares) and movement time were similar between PTSD and PD, they differed significantly in other areas such as respiratory disturbance and the phenomenological nature of their nightmares and nocturnal panic attacks. Further, agitated and restless dysphoria symptoms of hyperarousal (D1-D3) include features of both anxiety and depression, which correlate with the somatic complaints of these disorders (Elhai, Biehn, et al., 2011; Elhai, Contractor, Palmieri, Forbes, & Richardson, 2011). These studies suggest that symptom presentation may not be confined to unique symptoms for each diagnosis; rather that these 'dysphoric' hyperarousal symptoms may be both somewhat depression and anxiety related *or* a reflection of underlying cognitive dysregulation which is reflected across a number of disorders (Elhai, Biehn, et al., 2011).

Other research suggests that co-morbid conditions such as depression, substance abuse, and other anxiety disorders are secondary to PTSD, with this highlighted by the high rates of other disorders consistently found in PTSD populations, rather than vice versa (Creamer et al., 2001b). However, the authors of this claim noted that this does not preclude the possibility of shared risk factors, a possibility that is further explored with the assessment of hyperarousal as a predictor of disorders other than PTSD in this thesis.

Despite the overlap in symptoms across disorders, no research to date has focused on how specific symptoms of PTSD (e.g. the hyperarousal cluster) predict other disorders, such as anxiety and depression. For instance, sleep difficulties are a common symptom of a number of other DSM disorders including panic disorder (PD) and depression. Yet it is unclear how PTSD related sleep difficulties might predict the onset of other psychological disorders. Given that we have established hyperarousal as a central construct of PTSD in terms of symptom onset and maintenance, the next step is

to explore whether hyperarousal plays a significant role in the onset of other psychological disorders, and thus should be discussed as a construct that represents an underlying cognitive dysregulation in response to trauma that is less specific to PTSD as it is to overall symptomatic decline (Elhai, Contractor, et al., 2011). Thus, one aim of this thesis will be to explore *how hyperarousal predicts the future onset of psychological disorder. Specifically, based on available evidence, it is hypothesised that hyperarousal will be predictive of future anxiety and affective diagnoses.*

This hypothesis is drawn from the research that establishes sleep difficulties as a common symptom of anxiety and depression, as well as being a symptom of hyperarousal (Kilpatrick et al., 2003; Mellman et al., 2002; Sheikh et al., 2003).

1.10. Impact of hyperarousal on functional impairment and quality of life

It is important to note that one critical diagnostic criterion (Criterion F in the DSM-IV, Criterion G in the more recent DSM-5) of PTSD is that symptoms must cause significant distress or functional impairment. Therefore, it is essential to determine how much impairment is associated with hyperarousal, and how this differs from the impairment caused by the other symptom clusters of PTSD. For the purpose of discussing functional impairment in this thesis, the World Health Organisations Quality of Life domains (as outlined in the WHO-QOL bref, further discussed in detail in the methods chapter) have been used. These domains measure impairment across four domains; Physical (e.g. pain, energy levels, mobility, working capacity), Psychological (e.g. positive and negative feelings, concentration and memory), Social (e.g. personal relations, sex, support), and Environment (e.g. financial resources, recreation and leisure, transport) (Skevington, Lotfy, & O'Connell, 2004).

In a study of Kosovo peacekeepers, different symptom clusters of PTSD were found

to be associated with various functional impairment outcomes (Maguen, Stalnaker, McCaslin, & Litz, 2009). Symptoms of hyperarousal were identified as the strongest predictor of post-deployment functional impairment, particularly in areas of employment and relationships (Maguen et al., 2009). The use of conglomerate measures (measures that assess broad domains of functioning) and the non-reporting of specific functional impairment outcomes (how individuals are specifically impaired across different domains of functioning) limits the strength and generalisability of these findings (Maguen et al., 2009). Further, given the specificity of this research to a military population, it's difficult to know if the findings can be generalised to all post-trauma recovery.

In a later study of veterans deployed to Iraq, numbing and avoidance symptoms were the strongest predictors of interpersonal and social functioning, whereas hyperarousal was the strongest predictor of overall PTSD severity and life distress (M. T. Shea, Vujanovic, Mansfield, Sevin, & Liu, 2010). The authors suggest that the persistent nature of hyperarousal symptoms might explain the strong associations with subjective distress (M. T. Shea et al., 2010). These symptoms are also likely to have a strong impact on an individual's capacity to focus, maintain attention, complete tasks, and successfully work with others, thus contributing to poorer overall functioning (M. T. Shea et al., 2010). In relation to objective markers of function, there is a substantial body of research characterizing the neurocognitive abnormalities in PTSD that underpin these functional impairments (Clark et al., 2009).

In one of few studies assessing the predictive value of PTSD symptoms for quality of life, a group of physically injured non-domestic violence victims were longitudinally investigated over 12 months (Johansen, Wahl, Eilertsen, Weisaeth, & Hanested, 2007). The results showed that the presence of PTSD symptoms predicted lower quality of life (both acutely and over time). The findings of this investigation were limited, however,

by the clustering of all PTSD symptoms together to predict quality of life outcomes, and by the non-inclusion of an hyperarousal criterion in PTSD symptomology, a highly probable extraneous predictor of post trauma quality of life (Johansen et al., 2007).

Only one study published to date has indicated that symptoms of hyperarousal may be more closely linked to psychopathology and functional impairment compared to other symptoms of posttraumatic stress following a sudden onset, short duration, natural disaster event (Heir, Piatigorksy, & Weisaeth, 2010). Findings of a 2010 study of 899 Norwegian tsunami survivors indicated that hyperarousal had stronger correlations than intrusion with seven out the ten impairment variables, and stronger correlations with all ten variables than the avoidance cluster (Heir et al., 2010). However, this study was limited by the use of a self-report measure of PTSD symptoms rather than a clinically administered scale, which would provide a far more accurate symptom profile of symptom frequency and intensity rather than just symptom endorsement. This thesis extends this research in particular by examining the impact of the individual symptoms of hyperarousal in an injury sample. The strength of the current study lies in its use of a clinician-administered measure of mental disorder – the Mini-International Neuropsychiatric Interview (M.I.N.I.).

Hyperarousal has been shown to predict post-deployment impairment (Maguen et al., 2009), overall symptom severity and life distress (M. T. Shea et al., 2010), and is highly correlated with functional impairment and other psychopathology (Heir et al., 2010). PTSD symptoms have also been previously shown to predict lower quality of life scores (Johansen et al., 2007), The findings from these studies are limited, however, by several methodological issues including poor measures of functioning, the use of trauma specific samples and in one study the exclusion of the hyperarousal criterion from the predictive model. Thus, it is currently unclear as to the role hyperarousal plays in predicting quality of life and functional impairment post-trauma. This thesis aims to

expand on this previous literature determining *the extent to which the symptom clusters of PTSD predict post-trauma quality of life and disability.* Given the previous findings of Heir et al., (2010), Maguen et al., (2009), and Shea et al., (2010), it is hypothesised that *hyperarousal will be a stronger predictor of both poorer quality of life and greater disability compared to the symptom clusters of re-experiencing and avoidance and numbing.*

1.11. Why the symptoms? Breaking down the indicators of hyperarousal

Despite recent research highlighting the prominent role of hyperarousal in the development and maintenance of PTSD, little research has broken down the monolithic entity of hyperarousal as criteria and focused on the relationships that may exist between the five symptoms that make up the criteria. Whilst each of the symptoms of hyperarousal have often been independently studied following trauma (as outlined in the following breakdowns), there is currently no literature evaluating the predictive relationships that may exist within this cluster and thus lead to the development of further PTSD symptomology.

1.11.1. Difficulty falling or staying asleep

Sleep difficulties are widely recognized as a hallmark of PTSD due to its easy portrayal in popular media (i.e. television showing a person with PTSD suffering from recurring dreams, a symptom of re-experiencing that is by its nature closely-related to sleep difficulties of hyperarousal), and is perhaps the most readily self-identifiable symptom of hyperarousal (Belleville, Guay, & Marchand, 2009; Germain, 2013; Lamarche & De Koninck, 2007). More than 70% of individuals diagnosed with PTSD report significant sleep difficulties that correlate positively with further symptom severity (Belleville et al., 2009; Ohayon & Shapiro, 2000). The problems of sleep initiation, maintenance and non-

restorative sleep (insomnia) are common amongst individuals diagnosed with PTSD, as is the experience of nightmares, or anxiety dreams, that occur both in and out of REM sleep (Belleville et al., 2009; Lamarche & De Koninck, 2007; Mellman et al., 2002). A Canadian study of 583 participants who presented at a psychiatric facility with PTSD as their primary diagnosis found that individuals with PTSD experience more stage one sleep, less slow wave sleep and greater rapid eye movement sleep density compared to those who have a normal psychopathology (Belleville et al., 2009). This poor sleep quality further impacted on PTSD symptom severity and poorer perceived mental health, highlighting the need for interventions on individuals sleep to optimise recovery from PTSD (Belleville et al., 2009).

Several hypotheses exist in relation to potential causes of PTSD related insomnia. Physiologically, an inappropriate recruitment of normal REM sleep processes or mechanisms (A. R. Morrison, 1989), hyper-aroused noradrenergic activity (arousal regulators) (Mellman, Kumar, Kulick-Bell, Kumar, & Nolan, 1995), and comorbidity of sleep disorders such as sleep movement disorder (Krakow et al., 2000) have all been observed in individuals with PTSD (Germain, 2013; Lamarche & De Koninck, 2007). Psychologically, sleep related anxiety, defined as either the fear of going to sleep, or returning to sleep upon wakening, or due to the trauma being connected to sleep via location (i.e. sexual abuse in the bedroom) has been used to explain potential causes of sleep related difficulties in PTSD (Inman, Silver, & Doghramji, 1990). Comorbidity of other disorders such as depression and substance abuse have also been observed in individuals with PTSD. This may be explained by the association between depression and increased REM density (ocular activity per minute of REM sleep) (Dow, Kelsoe Jr, & Gillin, 1996), thus altering individuals natural sleep cycles; and alcohol and other substances altering sleep cycles and patterns via self-medication (Keane, Lyons, Wolfe, & Gerardi, 1988). Despite research into these areas, the underlying mechanisms of PTSD

related insomnia are not yet completely understood. However, current evidence suggests that sleep difficulties are the result of underlying neurological dysregulation that form a basis for further symptomology to develop (Germain, 2013; Lamarche & De Koninck, 2007).

There is ongoing debate as to whether sleep difficulties predispose individuals to PTSD or PTSD leads to the exacerbation of sleep difficulties (Belleville et al., 2009; Lamarche & De Koninck, 2007). Thus it is uncommon for PTSD treatments to include a specific sleep component, despite the correlation between level of sleep disturbance and PTSD symptom severity (Belleville et al., 2009; Krakow et al., 2001; Lamarche & De Koninck, 2007). However, it has been found that when sleep disturbance is treated, through either pharmacotherapy or psychological methods such as Cognitive Behavioural Therapy (CBT) or imagery rehearsal, PTSD symptoms are significantly reduced, particularly the other symptoms of criterion D that are exacerbated by unsatisfying sleep (Belleville et al., 2009; Lamarche & De Koninck, 2007). This reduction in other symptoms resulting from the treatment of sleep difficulties suggests that improving an individuals sleep quality may optimise PTSD interventions, and promote a healthier state of functioning (Belleville et al., 2009). Further, this finding in combination with the previously established relationship of hyperarousal to the onset and maintenance of other symptom clusters of PTSD (re-experiencing and avoidance) (Marshall et al., 2006; Pietrzak et al., 2013; Schell et al., 2004) suggest that sleep difficulties may be an early marker of intervention for the prevention of further PTSD symptomology (Germain, 2013).

1.11.2. Irritability or outbursts of anger

Irritability is often been portrayed as a key characteristic of PTSD, particularly among military veterans. PTSD is this context is characterised by inefficient regulation of

physiological arousal and subsequent readiness to anger (Chemtob, Novaco, Hamada, Gross, & Smith, 1997; Olatunji, Ciesielski, & Tolin, 2010; Orth & Wieland, 2006). The irritability (and subsequent anger) demonstrated by individuals with PTSD has been associated with interpersonal difficulties, such as violent behaviour and marital strain, physical health problems, and is linked to substance abuse and other anxiety (although it is unclear presently if this is a cause or affect relationship) (Olatunji et al., 2010).

It is possible that the association between anger and anxiety may reflect dysregulation of shared, biologically-prepared affective processes central to human survival, such as human emotion and the flight-or-fight response (Olatunji et al., 2010). The flight or fight response is an evolutionary adaptive response to danger, whereby in the presence of threat, an individual will either take 'flight' in order to evade a potential threat in the environment, or will 'fight' the threat, such as a predator that is encroaching one's environment. This theory suggests that anger in PTSD is the manifestation of an individual's excessive anxiety regarding their inability to actively cope with stimuli in their environment and their preparedness to 'fight' the perceived threat (Olatunji et al., 2010).

In a meta-analytic review of the specificity of anger to PTSD, Olatunji, Ciesielski and Tolin (2010) found that PTSD, compared to other anxiety disorders, was associated with a greater likelihood of anger control problems, via both 'anger in' (tendency to suppress angry feelings), and 'anger out' (tendency to express anger outwardly at individuals or objects through physical or verbal behaviour). In contrast, anger expression, state anger (current anger feelings) and trait anger (the experience of angry feelings over time and in response to a variety of situations) was not more prominent in PTSD (Olatunji et al., 2010; Orth & Wieland, 2006). These results support the notion that

PTSD related anger is a reflection of a general systemic regulatory problem rather than a specific anger problem.

Thus, whilst irritability and readiness to anger is often portrayed as a central characteristic of PTSD, particularly when western media portrays veteran populations, recent research suggests that rather than being causal of PTSD symptoms and distress, irritability is a manifestation of underlying cognitive dysregulation resulting from post-traumatic stress (Orth, Cahill, Foa, & Maercker, 2008). A better understanding of the causes, correlates and consequences of irritability in PTSD sufferers has the potential to improve treatment outcomes and offer substantial quality of life benefits, particularly interpersonally (Cahill, Rauch, Hembree, & Foa, 2003; Olatunji et al., 2010; Orth & Wieland, 2006). Moreover, the improved treatment of chronic anger and hostility could provide a break in the cycle of violence, whereby traumatised individuals themselves can become the perpetrators of aggression and violence and thus continue the cycle of trauma (Orth & Wieland, 2006).

1.11.3. Difficulty concentrating

PTSD can also be characterised as a disorder of memory, through the involuntary recollection of traumatic experiences of the same intense psychological and somatic arousal as the original trauma that in turn produce cognitive deficits such as concentration difficulties (McNally, 2006; Moores et al., 2008). In studies of brain and cognitive function, sufferers exhibit hypo-responsive prefrontal cortical region and/or a hyper-responsive amygdala activity, resulting in a number of cognitive ability deficits, manifesting under the guise of difficulty concentrating on everyday activities (McNally, 2006; Vasterling et al., 2002). Cognitions related to an individual's trauma can be triggered by common senses (sight, smell, sounds, touch) resulting in an intrusive recollection, captured attention, and slowing – resulting in a loss of task-processing

skills (McNally, 2006). Sustained attention deficits and loss of working memory skills, indicative of frontal limbic system abnormalities, resulting in a higher rate of omission errors on continuous performance tasks, have been noted in as many as 67-100% of military veteran PTSD sufferers (Vasterling et al., 2002; Vasterling, Constans, Brailey, & Sutker, 1998). Interestingly, it is only *sustained* attention that has been found to be deficient in PTSD cases, with selective attention and flexibility in shifting attention remaining largely unaffected (Vasterling, Constans, et al., 1998). In relation to memory function in PTSD, initial acquisition of information to memory is reduced alongside an increase in sensitivity to retroactive interference, suggesting a loss in working memory function caused by an inability to filter irrelevant information (Vasterling, Constans, et al., 1998). These findings taken together suggest that concentration difficulties may be characterized by a loss of working memory function, whereby the inability to filter irrelevant information creates problems in sustained attention due to an overload of cognitive processes caused by arousal dysregulation (the loss of the ability to filter distractions in the environment due to the hyperaroused functioning of limbic systems) (Vasterling, Constans, et al., 1998). Thus, working memory, and in turn, difficulty concentrating, may reflect a failure to inhibit extraneous material in those with PTSD, and thus promote other symptoms of arousal that involve extraneous environmental stimuli such as hypervigilance and exaggerated startle response (Vasterling, Constans, et al., 1998).

1.11.4. Hypervigilance

Hypervigilance, defined as the bias in visual attention for threat-related material, is a commonly reported symptom in individuals exposed to trauma whether or not they go on to develop PTSD (Buckley, Blanchard, & Neill, 2000; Dalgleish, Moradi, Taghavi, Neshat-Doost, & Yule, 2001). However, this symptom may reflect a pre-existing vulnerability that exists prior to initial trauma exposure in some individuals. It has been

proposed, for example, that the cognitive structures of anxious individuals in particular are biased towards threat-related stimuli, established in early life, which favour the intake of schema congruent threat-related stimuli in their environments (Dalgleish et al., 2001). This theory postulates that some individuals are predisposed to experience a heightened sense of threat or danger from their environment. This would suggest a predisposing vulnerability to hypervigilance symptoms amongst some PTSD sufferers, which precedes trauma exposure (Dalgleish et al., 2001).

Whilst historically (and to a lesser extent presently) the heightened perception of danger and subsequent appraisal of one's individual capacity to deal with a threat had obvious survival value in an evolutionary sense, individuals with PTSD exhibit an excessive and maladaptive attentional hypervigilance to a greater range of cues in their environment which they perceive as threatening or dangerous (Buckley et al., 2000; Dalgleish et al., 2001). In individuals with PTSD, this hypervigilance can have additive and circular consequences, whereby as the individual perceives more threat, they become more anxious, leading to a further increase in hypervigilance with the individual caught in a vicious and growing cycle of disorder maintenance and progression (Dalgleish et al., 2001).

The developmental course of hypervigilance is particularly pertinent to military and veteran populations, who due to the nature of combat experiences are required to develop and maintain hypervigilance as a skill, particularly in the combat environment. To enable safe operating whilst in potentially hostile environments, individuals must remain constantly aware of their environment, regularly scanning for a wide range of threat-related stimuli (Kimble, Fleming, Bandy, Kim, & Zambetti, 2010; Kimble, Fleming, & Bennion, 2013). Despite this being adaptive in the sense of self-preservation, many of these individuals continue to experience these symptoms even after being removed

from the hostile war-environment and returned to the relative safety of their homes and families (Kimble et al., 2010; Kimble et al., 2013). This can detrimental as not only does the brain remain activated to previously neutral stimuli and thus promote potential neurobiological changes as the individual is consistently sensitised to a state of fear, hypervigilance can further manifest into tendencies towards suspicion and distrust, maintaining of weapons and escape routes, behaviours which further promote social isolation and problems within the family unit (Kimble et al., 2013).

1.11.5. Exaggerated startle response

Exaggerated startle response is a symptom that dates back to the First World War as a part of the manifestation of 'shell shock'. Many individuals with PTSD, particularly combat veterans, experience increased startle reactivity, specifically an exaggerated response to intense acoustic stimuli (such as a loud bang or scream) (Butler et al., 1990; Morgan, Grillon, Southwick, Davis, & Charney, 1996; Shalev et al., 2000). Larger magnitude eye blinks, increased skin conductivity, elevated heart rate response and slower habituation of skin conductance are characteristic symptoms of an individual experiencing exaggerated startle response (Guthrie & Bryant, 2005).

One theory, progressive neuronal sensitisation, suggests that heightened physiological reactivity is a major underlying factor in PTSD development which may explain the development of startle reactions (Guthrie & Bryant, 2005). This theory suggests that progressive sensitisation occurs at the biological level of neurons, as repeated stressors impact biochemistry and microstructures within the brain causing them to become more sensitive to stressors and stimuli within the individual's surroundings (Guthrie & Bryant, 2005; Post & Weiss, 1998). Specifically there is an increase and decrease in production of stress hormones such as epinephrine, norepinephrine and cortisol with cortisol, in particular, playing a significant role in a

series of biological reactions in the hypothalamic-pituitary-adrenal axis, and it has been suggested that the decrease in cortisol production post-trauma contributes to elevated arousal (Guthrie & Bryant, 2005; Resnick, Yehuda, Pitman, & Foy, 1995). Alternatively, another theory suggests that pre-trauma psycho-physiological arousal may predispose individual vulnerability for heightened reactivity post trauma (Guthrie & Bryant, 2005; Shalev et al., 2000). This theory was supported by the findings of Guthrie and Bryant (2005) who found that in fire-fighters examined pre and post trauma exposure, pre-trauma physiological activity correlated highly with their post-trauma startle response activity. These findings imply that there may be a predisposition in some individuals towards heightened reactivity pre-trauma, whereby these individuals are primed for a stronger response in the acute stages of trauma. More research is currently needed to assess whether there is a biological mechanism responsible for this stronger response in the earlier stages of trauma, and thus a pre-disposition to the uptake and maintenance of physiologically-based arousal symptoms (Guthrie & Bryant, 2005). The ability to identify individuals at risk for stronger response following trauma by the presentation of increased startle response in the acute stages of trauma could prevent the onset and maintenance of further disorder following a traumatic experience.

1.11.6. Summary

Each symptom that comprises the criteria of hyperarousal has a unique aetiology and each has its own body of literature dedicated to its individual pathology in different populations. Taken together as a cluster of PTSD, this dynamic set of symptoms have been shown to have significant ramifications for individuals post-trauma, with previous research noting that the hyperarousal symptoms are significantly predictive of subsequent symptom severity (Schell et al., 2004), maintenance of other symptom clusters within the disorder (Solomon et al., 2009), and are a key predictor in the manifestation of psychological distress (Marshall et al., 2006). Despite this, no research

to date has broken down the hyperarousal cluster from its aggregated diagnostic entity to assess the dynamic interplay between symptoms and assess how the cluster forms over time. By identifying how these individual symptoms interact over time, it may be possible to identify what drives the formation of the symptom cluster, be it one specific symptom or several of these symptoms taken together, and thus determine what symptoms are the true clinical markers for early intervention to prevent further PTSD symptomology. Thus, the final research question of this thesis is *4) How does Hyperarousal develop as a symptom cluster over time?* Table 1.1 below enumerates by chapter the aims and specific hypothesis of this thesis.

Table 1.1 Aims and hypotheses examined within this theses by chapter

Chapter 3: Hyperarousal following deployment: the impact of deployment and combat-related trauma on the presentation of hyperarousal in Australian Defence Force (ADF) members

Aim: to discover how different deployment and combat-related traumas impact the symptom presentation of hyperarousal.

Hypothesis: Traumas involving the perception of threat will be the strongest predictor of hyperarousal.

Chapter 4: Predicting future disorder: the role of hyperarousal in predicting onset of future disorder

Aim: To explore how hyperarousal predicts the future onset of psychological disorder.

Hypothesis: Hyperarousal will be predictive of future anxiety and affective diagnoses

Chapter 5: Quality of life and impairment 12 months post-injury: the contributions of PTSD criteria B, C, and D.

Aim: To examine the extent to which the symptom clusters predict post-trauma quality of life and disability

Hypothesis: Hyperarousal will be the strongest predictor of both poorer quality of life and greater disability compared to the symptom clusters of re-experiencing and avoidance and numbing.

Chapter 6: Surviving a traumatic injury: exploring the longitudinal interaction of hyperarousal symptoms

Aim: To examine how hyperarousal develops as a symptom cluster over time following a traumatic event.

1.12. Conclusion

This thesis aims to test the proposal that hyperarousal is a central construct of PTSD, a unique cluster of symptoms that is significantly predictive of subsequent PTSD symptom severity (Schell et al., 2004), maintains other symptom clusters within PTSD (Solomon et al., 2009), and predicts psychological distress (Marshall et al., 2006). Supported in theory by the literature of sensitisation, animal models and the neurobiology of PTSD (Lapiz-Bluhm & Peterson, 2014; Van der Kolk, 2004), this thesis postulates that hyperarousal is the critical determinant of post-trauma sequelae. To address this, this thesis will specifically focus on the hyperarousal cluster and its individual symptoms.

Much research has focused on the nature of the trauma as a significant predictor of PTSD. Previous military research has found that being deployed, particularly to a combat zone, is a risk factor for PTSD (Hermann et al., 2012), and postulated that being in a threatening situation is predictive of symptoms of PTSD (Iversen et al., 2008; D. W. King et al., 1999; L. A. King et al., 2008; Vasterling et al., 2010). This thesis will build on their findings using a military cohort to examine *how different deployment and combat-related traumas impact the symptom presentation of hyperarousal.* Research into comorbidity of PTSD and other disorders also highlights the overlap between symptoms of hyperarousal with symptoms of anxiety and depression, suggesting it may reflect an underlying cognitive dysregulation, or alternatively a predisposition to disorder that is secondary to the diagnosis of PTSD (Creamer et al., 2001b; Elhai, Biehn, et al., 2011; Elhai, Contractor, et al., 2011). As an extension to this research, this thesis aims to explore whether hyperarousal plays a significant role in the onset of other psychological disorders, by *examining whether hyperarousal predicts future episodes of psychological disorder.*

The impact of a disorder and its symptoms on an individual's level of functioning and thus their quality of life is critical in determining its relative need for treatment and intervention. A diagnosis of PTSD has previously been found to predict lower quality of life scores (Johansen et al., 2007), and hyperarousal has been associated with post-deployment impairment, overall PTSD symptom severity, life distress, functional impairment and other psychopathology (Heir et al., 2010; Maguen et al., 2009; M. T. Shea et al., 2010). This thesis aims to expand on this previous literature by *examining how the symptom clusters of PTSD predict post-trauma quality of life and disability.*

The final stage of this thesis will be to determine how the individual symptoms that comprise the criterion of hyperarousal emerge over time. By delineating this pattern of symptom development, it may be possible to identify the underlying drivers of hyperarousal, be it one specific symptom or several of these symptoms combined. In doing so, true clinical markers for early symptom intervention could be determined to provide the theoretical basis upon which clinicians could target interventions and therapy to treating the drivers of hyperarousal, and thus prevent further PTSD symptomology. Thus, the final research question to be addressed in this thesis is *how Hyperarousal develops as a symptom cluster over time.*

In answering these novel research questions through the analysis of three unique epidemiological samples, this thesis will not only contribute substantially to understanding of the phenomena that is PTSD, but also provide critical insight into the role of hyperarousal both as a cluster and as individual symptoms, in disorder development, as well as functional impairment. From a theoretical perspective, this thesis will broaden the current understanding of PTSD and post-trauma recovery, and what role the hyperarousal cluster plays in this process. Further, this research has significant clinical implications, with the potential to indentify clinical markers that can

be utilised to identify individuals; at risk of future PTSD symptomology through both their presenting symptoms and the traumas they have suffered; at risk of further onset of novel psychopathology; and with symptoms that can be targeted by therapeutic intervention to prevent poorer quality of life following a traumatic event.

2. Samples and Methodology

2.1. Introduction

The following chapter provides a detailed summary of the three datasets utilised in this thesis. This includes a summary of the research questions and hypotheses addressed using each dataset. A detailed description of the final samples used for analysis is also provided together with an analysis of the differences between responders and non-responders. The methodology and instruments employed as part of the broader research methodology for each project are discussed in the corresponding chapter.

2.2. Middle East Area of Operations (MEAO) Health Study

The MEAO prospective study (*The Middle East Area of Operations (MEAO) Health Study: Prospective Study Report*, 2012) was developed to provide insight into the impact of deployment and combat exposure in the Middle East Area of Operations (MEAO) on the health of Australian Defence Force (ADF) personnel. Undertaken by the Centre for Traumatic Stress Studies, the prospective study comprised a self-report survey, as well as physical, biological and neurocognitive assessments. In order to ensure that any changes in health outcomes could be attributed to deployment to the MEAO, participants were examined immediately prior to and directly after their return from deployment to the MEAO. The study population was recruited from units deployed to the MEAO after June 2010 and returned by June 2012, and were sourced from one navy ship, two army mentoring task force units, one force communications unit, two force support units, two special operations task groups, two air force combat support units, one Airforce C130, one Airforce 92 wing, as well as members deployed from the multi task group and coalition units. As the research presented in this thesis is related to deployment specific traumas, only those who completed both the pre and post deployment components were included in the final analysis.

In this thesis, data from this study was used to address *how different deployment and combat-related traumas impact the symptom presentation of hyperarousal.* The specific hypothesis formulated in regards to this research question was that *deployment traumas that involve the perception of threat would be most predictive of hyperarousal.*

The MEAO prospective study was chosen to address this question as it allowed a unique look at the presentation of hyperarousal both pre and post-deployment. The recording of hyperarousal symptoms both immediately prior to and upon return from deployment, as well as documentation of the unique deployment specific experiences

and demographics, allowed for analysis as to the impact of deployment specific factors on the hyperarousal criteria longitudinally in a relatively recent period post-deployment. The use of this population allowed examination of the impact of repeated number and types of exposures to trauma over an extended period on the presentation of hyperarousal. The large sample size and comparability to previous military studies of trauma and PTSD added considerable strength to the results and reduced the risk of response bias from the self-report measures used in this study.

2.2.1. Measures

2.2.1.1. Neurocognitive and physical assessments

Participants underwent a battery of physical testing components and neurocognitive assessments to evaluate the impact of deployment on health outcomes, both the physical and psycho-physiological, that included height, weight, waist and hip circumference recording, blood pressure testing, lung function spirometry testing, and a cardiovascular fitness assessment. Photographs were also taken of each participant to assess dermatological skin changes, as well as a 40ml blood sample to measure chronic infections, inflammation markers and biochemistry. This data was not utilised for the purposes of this thesis, however, a summary of results and more information regarding the measures and protocols that were utilised can be found in the Middle east Area of Operations (MEAO) Health Study: Prospective Study report.

2.2.1.2. Self-report questionnaires (pre and post-deployment)

The self-report questionnaires were designed to collect measures of psychological, physical and social health at the pre and post-deployment assessments, as well as potentially traumatic exposures and life experiences. The pre-deployment questionnaire (Appendix B) covered participant's deployment history, including countries deployed to, operation name, year of deployment, and number of times

deployed and total time deployed (months). Information was then gathered on their pre-deployment health, including physical, mental, social function, and health risk factors. Finally individual factors of personality and resilience were assessed, as well as prior life experiences that could contribute to particular health outcomes.

The post-deployment survey (Appendix C) covered post-deployment health, particularly physical and mental health, social function and health risk since the beginning of their last deployment. The second half of the questionnaire covered recent deployment experiences, designed to elicit the health hazards and threats that occurred in relation to their latest deployment to the MEAO. In both self-report questionnaires, participants were assessed on their psychological distress (K10)(Kessler et al., 2002), depressive symptoms (PHQ-9) (Kroenke, Spitzer, & Williams, 2001), PTSD symptoms (PCL-C) (F.W. Weathers, Litz, Herman, Huska, & Keane, 1994), Anxiety syndromes (PHQ-15) (Kroenke, Spitzer, & Williams, 2002), Alcohol Use (AUDIT) (Saunders, Aasland, Babor, De la Fuente, & Grant, 1993), and smoking status. A more detailed description of the measures utilised in this thesis are presented within chapter 3.

2.2.2. Participants

In order to be eligible, individuals had to be current serving members of the ADF and be deploying to the MEAO after June 2010, returning to Australia by June 2012. This eligibility was inclusive of all ranks, service, gender, deployment length, and country of deployment, role, and previous deployment history. Participants were excluded if they were not members of the ADF, including civilian contractors, government officials, aid workers, DSTO contractors, public servants, Federal police or ADF personnel accompanying Government officials not technically required for conduct of operations. Table 2.1. Shows the population for the self-report data.

Participants were sourced from one ship and 13 Units within the ADF who met eligibility and agreed to participate. Data was also collected from a number of personnel who did not deploy as part of a unit.

Table 2.1. Demographic and service characteristics of the MEAO prospective study population

Characteristics	Sub groups	Population N
Total Sample		3074
Sex	Female	250
	Male	2824
Age	16-24	1076
	25-34	1270
	35-44	543
	45-54	160
	55 and over	23
	Missing Age	2
Service	Navy	233
	Army	2289
	Air Force	552
Rank	Officer	467
	NCO	1212
	Other ranks	1395
Duty	Regular	1762
	Reservist	118
	Missing Duty	1194

Table 2.2. Proportion of MEAO prospective study participants who completed pre and post deployment survey

Characteristic		Population (N)	Pre Only N (%)	Pre- and Post Deployment N (%)	Non Responders N (%)
Total		3074	547 (17.8%)	1324 (43.1%)	1203 (39.1%)
Sex	Male	2824	502 (17.8%)	1197 (42.4%)	1125 (39.8%)
	Female	250	45 (18.0%)	127 (50.8%)	78 (31.2%)
Age	16-24	1076	203 (18.9%)	397 (36.9%)	476 (44.2%)
	25-34	1270	257 (20.2%)	528 (41.6%)	485 (38.2%)
	35-44	543	76 (14.0%)	272 (50.1%)	195 (35.9%)
	45-55	160	11 (6.9%)	108 (67.5%)	41 (25.6%)
	55+	23	0 (0.0%)	19 (82.6%)	4 (17.4%)
	Missing	2	0 (0.0%)	0 (0.0%)	2 (100.0%)
Service	Navy	233	32 (13.7%)	69 (29.6%)	132 (56.7%)
	Army	2289	397 (17.3%)	925 (40.5%)	967 (42.2%)
	Air Force	552	118 (21.4%)	330 (59.8%)	104 (18.8%)
Rank	Officer	467	66 (14.1%)	245 (52.5%)	156 (33.4%)
	NCO	1212	218 (18.0%)	523 (43.2%)	471 (38.8%)
	Other Ranks	1395	263 (18.9%)	556 (39.9%)	576 (41.2%)

As shown by tables 2.1 and 2.2, the majority or participants in this study who were recorded at both pre and post deployment were males aged between 16-34 who were serving in the Royal Australian Army. This is consistent with the characteristics of the ADF in general in particular those who deploy. Participants in this sample were

mainly drawn from the lower ranks (Other) and Non Commissioned Officers, with officers comprising smallest proportion of those who were assessed pre and post deployment.

Table 2.3 shows the lengths of deployment to the MEAO in those who completed the pre and post questionnaire. Table 2.4 shows the breakdown of the roles carried out by those same participants whilst on deployment. A further analysis of these participants' deployment experiences and outcomes is contained in the following chapters.

Table 2.3. Length of most recent deployment for pre and post responders in the MEAO prospective study

Length of most recent deployment	Number (%) respondents
≤ 5 months	400 (30.2%)
6 or 7 months	404 (30.5%)
8 months	290 (21.9%)
9-12 months	230 (17.4%)

Table 2.4. Role on most recent deployment for MEAO prospective study survey responders

Role on deployment	Number (%) respondents
Combat Afghan & Outside MSB	686 (51.8%)
Inside MSB	299 (22.6%)
Outside Afghanistan	339 (25.6%)

As shown in tables 2.3 and 2.4, the majority of the sample deployed for less than 7 months, and were deployed in Combat roles either in Afghanistan or outside the main support base in Iraq. Rates of Hyperarousal and PTSD pre and post-deployment to MEAO are discussed in length in Study 1.

2.2.3. Non-responders

The sample utilised in Study 1 consisted of the n=1324 participants in the MEAO prospective study who were collected pre and post deployment. Table 2.5 below shows the demographics of this group, labelled responders, and the original study population who were contacted at pre deployment to assess whether there were any significant differences between the two samples.

Table 2.5. Responders and non-responders differences in the MEAO prospective study

Characteristic		*Non responders N=1750*	*Study 1 Sample N=1324*	*p*
		N(%)	*N(%)*	
Age (M(SD))		30.03 (8.49)	30.9 (9.02)	Non-sig.
Gender	Male	1567 (89.5)	1127 (85.1)	<.001
	Female	122 (7)	127 (9.6)	
Rank	Officer	222 (12.7)	245 (18.5)	<.0001
	NCOs	689 (39.4)	523 (39.5)	
	Lower ranks	839 (47.9)	556 (42)	
Service	Air force	222 (12.7)	330 (24.9)	<.0001
	Army	1364 (77.9)	925 (69.9)	
	Navy	164 (9.4)	69 (5.2)	
Number of previous traumas (M(SD))		2.48(2.72)	2.41 (2.44)	.606

Significant differences existed between the sample utilised and the non-responder group. The study population had significantly more females (p<.001), and consisted of

more officers and less of the lower ranks than those who did not participate (p<.0001). A higher percentage of participants were collected from the air force than the original sample (p<. 0001). There was no significant difference in the mean number of previous traumas in the study sample compared to the original sample(p=.606).

2.3. The South East Life Study (SELIFE)

The South East Lifetime Impact of Fire Exposure Study (SE LIFE) was first initiated immediately following the Ash Wednesday Bushfires of February 16th, 1983 to assess the impact of a major Australian natural disaster on the behaviour and health of children living in the South East region of South Australia (McFarlane, 1987a, 1987b; McFarlane, Policansky, & Irwin, 1987; Van Hooff & McFarlane, 2009). Spreading across vast portions of both Victoria and South Australia, the Ash Wednesday bushfires affected some 120, 000 hectares of agricultural and forest lands, killing 200, 000 live stock and devastating 359 farming properties in South Australia alone. Fourteen lives were claimed by the fires, including a mother and her four children, as flames reached up to 250 metres high and were pushed across the region by cyclonic strength winds which were so strong they reportedly snapped the trunks of mature radiata pines in the region.

Participants were initially recruited in a two-year period following the disaster to assess the impact of the fires on school-aged children. Now in its fifth stage of follow up, 28 yrs after the initial trauma, the study has grown into a unique epidemiological assessment of the lifetime impact of fire exposure and other lifetime trauma on children growing up in the South East of South Australia.

This unique longitudinal data set was used in this thesis to assess *whether hyperarousal predicted the future onset of psychological disorder.* Specifically, it was hypothesised that *hyperarousal would be predictive of future anxiety and affective diagnoses.*

The SELIFE dataset was utilised to answer this research question as it gave a unique insight into the development of disorder over an extended period of time. A clinician-administered interview was utilised to assess previous and current psychopathology, including the symptoms of hyperarousal at time 4, and the same interview (although an updated version) at a later follow-up at time 5. This allowed a unique look as to how the symptoms of hyperarousal recorded at time 4 predicted episodes of disorder up to time 5, in a population which had extensive recording of their prior trauma history and previous psychopathology. The large sample size and high success rate for follow-up were also a considerable strength, reducing the risk of response bias and adding to the generalisability of the conclusions drawn from this data to the wider population of young adults in the Australian community.

Previous studies published utilising this study sample include; a community validation of the SPHERE questionnaire (McFarlane, McKenzie, Van Hooff, & Browne, 2008) a 20-year longitudinal follow-up study into the impact of childhood exposure to a natural disaster on adult mental health (Van Hooff & McFarlane, 2009); the relationship between criterion A1 and PTSD (Van Hooff, McFarlane, Baur, Abraham, & Barnes, 2009); psychotic symptoms in young adults exposed to childhood trauma (Galletly, Van Hooff, & McFarlane, 2011); Predictors of Mental Health Service Utilisation in a Non-Treatment Seeking Epidemiological Sample of Australian Adults (Mills, Van Hooff, Baur, & McFarlane, 2012); and an analysis of the challenges of disaster research (McFarlane & Van Hooff, 2014).

2.3.1. Measures

A detailed description of the measures utilised in this sample are presented within chapter 4 of this thesis.

2.3.2. Procedure

Initial sample

Participants were initially recruited following the Ash Wednesday bushfires. Of the initial n=808 children recruited as a part of the bushfire sample, all but one attended schools which were threatened by the fires during their time of attendance (McFarlane, 1987a, 1987b; McFarlane et al., 1987). The mean age of the sample at this stage was M=8.44yrs. These children were evaluated two, eight, twenty-six months, twenty-years and twenty-eight years following the fires.

A control sample was recruited at the same time as the bushfire cohort so that comparisons could be made against a demographically matched sample that was not exposed to the fires. Seven hundred and twenty five children from Naracoorte in the South East of Australia were recruited in 1985 to be a part of this sample. The mean age of this sample was M=7.39yrs

For the purposes of this study, the twenty-year and the twenty-eight year follow-up were utilised. For the 20-year follow-up – all 1532 individuals who participated at any stage in childhood were initially re-contacted via post, with study information and a consent letter (Appendix D) included in a pre-paid return envelope (Van Hooff & McFarlane, 2009). Participants were tracked through the state department of Births Deaths and Marriages, the Australian Electoral Commission, and an online telephone directory, based on their previous successful completion of the study in childhood. A national death registry was used to identify any participants who had passed during the time between these follow-ups.

2.3.3. Participants

A total of 440 participants were utilised for this paper with selection for inclusion in the analysis based on the successful completion of the CIDI interview at both Time 4

(20 year follow-up) and Time 5 (28 yr follow-up). The sample consisted of N=194 (44.1%) men and 246 (55.9%) women. The average age for this sample at Time 4 was M=36.31, SD=2.214. Tables 2.6 and 2.7 below show the marital and occupational status of participants at the final stage of follow-up, Time 5.

Table 2.6. Marital status of SELIFE participants at the 28 yr follow-up (n=133 were missing data)

Marital status	N (%)
Married	314 (67.7)
Separated	12 (2)
Divorced	16 (2.7)
Never married	52 (8.7)
Widowed	0
Defacto	70 (11.7)

Table 2.7. Occupational Status of SELIFE participants at the 28 yr follow-up

Occupational Status	N (%)
Work part time of casual	111 (23.9)
Work full time	284(61.2)
Unemployed looking for work	6 (1.3)
Unemployed not looking for work	1 (.2)
Disability pension	9 (1.9)
Unpaid voluntary work	1 (.2)
Student	6 (1.3)
Home duties	35 (7.5)
Other	11 (2.4)

As can be seen in tables 2.6 and 2.7, at 28 years following the fires the majority of the sample displayed low levels of social measures of disability, with the majority being married (67.7%) and working full-time (61.2%) at the time of the 28 yr assessment (table 6).

Rates of Hyperarousal, PTSD and other disorder diagnosed at time 4 and Time 5 within this sample are discussed in detail in study 2.

2.3.4. Non-Responders

Non-responders for this sample were individuals who participated in the study at time 4 but were not followed up at time 5. As shown in table 2.8 below, there were significant gender differences between the sample and those who responded at time 4, with a lower percentage of male and a higher percentage of female participation.

Table 2.8. A comparison of responders and non-responders in the SELIFE study

Characteristic		SELIFE sample at time 4 n=1043	T4-5 Study sample n=440	p
		N (%)	N (%)	
Gender	Male	574 (55)	194 (44.1)	<.0001
	Female	469(45)	246 (55.9)	
Marital	Married	139 (38.8)	180 (40.9)	.289
	Separated	10(2.8)	8 (1.8)	
	Divorced	8 (2.2)	6 (1.4)	
	Never married	96 (26.8)	138(31.4)	
	Widowed	0	0	
	Defacto	105 (29.3)	108 (24.5)	
Occupational status	Work part time/casual	60 (16.8)	71 (16.1)	.106
	Work full time	225 (62.8)	292 (66.4)	
	Unemployed looking for work	13 (3.6)	7 (1.6)	
	Unemployed not looking for work	2(.6)	1 (.2)	
	Disability pension	1 (.3)	1 (.2)	
	Unpaid voluntary work	3(.8)	3 (.9)	
	Student	4 (1.1)	7 (1.6)	
	Home duties	45 (12.6)	38 (8.6)	
	Other	5 (1.4)	19 (4.3)	
Rates of Disorder	Lifetime disorder at T4	154 (14.8)	111 (25.2)	<.0001
	Any Anxiety disorder at T4	94 (9)	90 (20.5)	<.0001
	Any Affective disorder at T4	123 (11.8)	95 (21.6)	<.0001

The sample also differed significantly in the rates of life times disorder, with higher rates of lifetime, anxiety and affective disorder at time 4 than those who were sampled at time 4 only, suggesting that those who were healthier at time 4 did not participate in the

follow up. These differences need to be considered when comparing previous literature regarding this sample, as there are more females and they are more symptomatic compared to previous follow-ups. Therefore, in chapter 4, the results of the analysis as to how hyperarousal predicts future disorder may be more reflective of females with a high rate of disorder rather than of a general sample of individual's previously exposed to a natural disaster trauma, and should be interpreted within this context.

2.4. The Injury Vulnerability (IVS) Study

The Injury Vulnerability Study is a large-scale multi-site longitudinal study into mental and physical health following a traumatic injury (Bryant et al., 2015; Bryant, O'Donnell, et al., 2010). Five major trauma hospitals located in New South Wales, South Australia and Victoria were utilised to explore the factors associated with psychopathology following a traumatic injury over a 6-year period. Table 2.9 shows the breakdown of participants across hospital sites. For the purposes of this thesis, only data accrued in the acute, 3-month, and 12-month follow-ups of the study were utilised due to the nature of longitudinal path analysis and the difficulty of reporting multiple time-points in a concise manner.

Table 2.9. IVS study participants N(%) from each hospital site

Hospital	*N(%)*
Alfred	416(35.75)
Royal Melbourne	226(19.4)
Adelaide	307(26.4)
Westmead	179(15.4)
Liverpool	34(2.9)
Days in hospital	M=12.4(SD=12.9)

The data from this study was utilised in this thesis to address two major research questions and associated hypothesis. The first aim of this chapter was to assess *the relative contribution of each of the symptom clusters of PTSD to post-trauma quality of life and disability.* It was hypothesised that *hyperarousal would be a more significant*

predictor of both poorer quality of life and greater disability compared to the symptom clusters of re-experiencing and avoidance and numbing.

For the fourth and final analysis chapter within this thesis, the unique longitudinal assessment of PTSD throughout this study allowed this thesis to address *how do the symptoms of hyperarousal interact longitudinally post trauma?*

The IVS study data was utilised due to the longitudinal and consistent nature of the assessments in an injury trauma sample over what was a significant period of time. The collection of PTSD symptoms via clinician administered interview in the acute hospital setting, three months, and 12 months post injury allowed a unique insight into the change in PTSD and more specifically hyperarousal symptoms over time, as well as the modelling of the interaction between the waves of hyperarousal symptoms between assessments. The collection of quality of life and injury data at each stage of the longitudinal follow-up also allowed a unique insight into how the symptoms of PTSD and other common demographics and risk factors influenced the participant's quality of life and functional impairment 12 months post-injury.

Previous literature utilising this studies data is extensive, as can be seen in table 2.10 below.

Table 2.10. Previous literature published utilising data from the Injury Vulnerability Study

Author	*Year*	*Title*
Schweininger et al.	(2015)	The temporal relationship between mental health and disability after injury
Forbes, Lockwood, Creamer et al.	(2015)	Latent structure of the proposed ICD-11 post-traumatic stress disorder symptoms: implications for the diagnostic algorithm
Forbes, Lockwood Elhai et al.	(2015)	An evaluation of the DSM-5 factor structure for posttraumatic stress disorder in survivors of traumatic injury
Bryant, Creamer, O'Donnell, McFarlane & Silove	(2014)	A prospective study of rapid breathing and the development of posttraumatic panic disorder
Wade, Varker, Forbes & ODonnell	(2014)	The Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) in the assessment of alcohol use disorders among acute injury patients
Nickerson et al.	(2014)	The temporal relationship between posttraumatic stress disorder and problem alcohol use following traumatic injury
Bryant, Creamer, O'Donnell, Silove et al.	(2014)	A Comparison of the capacity of DSM-IV and DSM-5 Acute Stress Disorder definitions to predict Posttraumatic Stress Disorder and related disorders
Grant, O'Donnell, Spittal, Creamer & Studdert	(2014)	Relationship between stressfulness of claiming for injury compensation and long-term recovery
O'Donnell, Alkemade, et al.	(2014)	Impact of the diagnostic changes to post-traumatic stress disorder for DSM-5 and the proposed changes to ICD-11
O'Donnell, Creamer, Pattison & Atkin	(2014)	Psychiatric morbidity following injury
Bryant, O'Donnell et al.	(2014)	The psychiatric sequelae of traumatic injury
Bryant, O'Donnell, Creamer, McFarlane, & Silove	(2013)	A multisite analysis of the fluctuating course of posttraumatic stress disorder
O'Donnell, Varker, Holmes, et al.	(2013)	The cumulative burden of physical and mental health
O'Donnell, Varker, Creamer, et al.	(2013)	Exploration of delayed-onset posttraumatic stress disorder after severe injury
Forbes et al.	(2012)	Trauma at the hands of another: longitudinal study of differences in the posttraumatic stress disorder symptom profile following interpersonal compared with noninterpersonal trauma
Bryant, Creamer, O'Donnell, Silove, & McFarlane	(2012)	The capacity of acute stress disorder to predict posttraumatic psychiatric disorders
Carty, O'Donnell, Evans, Kazantzis, & Creamer	(2011)	Predicting posttraumatic stress disorder symptoms and pain intensity following

		severe injury: The role of catastrophising
Bryant, Brooks et al.	(2011)	Peritraumatic dissociation mediates the relationship between acute panic and chronic posttraumatic stress disorder
Forbes, Fletcher et al.	(2011)	Requiring both avoidance and emotional numbing in DSM-V PTSD: Will it help?
Bryant, O'Donnell, Creamer, McFarlane & Silove	(2011)	Posttraumatic intrusive symptoms across psychiatric disorders
O'Donnell, Creamer, McFarlane, Silove, & Bryant	(2010)	Does access to compensation have an impact on recovery outcomes after injury
Bryant, Creamer, O'Donnell, Silove, & McFarlane	(2010)	Sleep disturbance immediately prior to trauma predicts subsequent psychiatric disorder
Forbes et al.	(2010)	A longitudinal analysis of posttraumatic stress disorder symptoms and their relationship with fear and anxious-misery disorders: implications for DSM-V
O'Donnell, Creamer, McFarlane, Silove, & Bryant	(2010)	Should A2 be a diagnostic requirement for posttraumatic stress disorder in DSM-V?
Creamer et al.	(2009)	Evaluation of the Dispositional Hope Scale in injury survivors
O'Donnell et al.	(2009b)	Prior trauma and psychiatric history as risk factors for intentional and unintentional injury in Australia
Kenny et al.	(2009)	Distant memories a prospective study of vantage point of trauma memories
Forbes, Lockwood et al.	(2011)	An examination of the structure of posttraumatic stress disorder in relation to the anxiety and depressive disorders
Bryant et al.	(2009)	Post-traumatic amnesia and the nature of post-traumatic stress disorder after mild traumatic brain injury
Bryant et al.	(2009)	Post-traumatic amnesia and the nature of post-traumatic stress disorder after mild traumatic brain injury
Bryant et al.	(2008)	A multisite study of initial respiration rate and heart rate as predictors of posttraumatic stress disorder
Bryant et al.	(2008)	A multisite study of the capacity of acute stress disorder diagnosis to predict posttraumatic stress disorder
O'Donnell et al.	(2008)	A predictive screening index for posttraumatic stress disorder and depression following traumatic injury
O'Donnell, Elliot, Wolfgang & Creamer	(2007)	Posttraumatic appraisals in the development and persistence of posttraumatic stress symptoms
O'Donnell et al.	(2007)	PTSD symptom trajectories: From early to

		chronic response
Carty, O'Donnell & Creamer	(2006)	Delayed-onset PTSD: a prospective study of injury survivors
O'Donnell et al.	(2005)	Determinants of quality of life and role-related disability after injury: Impact of acute psychological responses
Creamer, O'Donnell & Pattison	(2005)	Amnesia, traumatic brain injury, and posttraumatic stress disorder: a methodological inquiry
Creamer, O'Donnell & Pattison	(2004)	The relationship between acute stress disorder and posttraumatic stress disorder in severely injured trauma survivors
O'Donnell, Creamer & Pattison	(2004)	Posttraumatic Stress Disorder and Depression following trauma: understanding comorbidity

2.4.1. Measures

2.4.1.1. Self-report questionnaire

Comprised of three sections, the acute-stage self-report booklet was administered after the completion of the clinical interview. The first half of the booklet gathered demographic information, such as ethnicity, occupation, income, education and living circumstances. The second section assessed participant's pre-injury quality of life (using the WHO-QOL bref) (Group, 1998; WHOQOL Group, 1996), their pre-trauma disability (WHOD-DAS 12) (Janca et al., 1996), pre-injury social support (Schuster social support questions: SSSQ) (Sarason, Levine, Basham, & Sarason, 1983), pre-injury sleep difficulties and alcohol use (AUDIT) (Saunders et al., 1993). The final section of the self-report booklet assessed post-trauma anxiety and depression, cognitive appraisal, pain (VAS) and problem-solving attitudes.

The self-report booklet administered at 3 and 12 months was highly similar to the acute self-report booklet. This booklet assessed anxiety and depression severity (HADS) (Spinhoven et al., 1997; Zigmond & Snaith, 1983), alcohol consumption (AUDIT) (Saunders et al., 1993), quality of life (WHOQOL bref)(Group, 1998; WHOQOL Group,

1996), disability (WHO-DASII) (Janca et al., 1996), Current and worst pain (VAS) (Bijur, Silver, & Gallagher, 2001), as well as health service use and social support (SSSQ) (Sarason et al., 1983). Life stressors in the 3-, 12 months prior to the assessment were also assessed (IES) (Horowitz, Wilner, & Alvarez, 1979). At the 12-month follow-up, somatisation was assessed using the SPHERE (McFarlane et al., 2008). Finally, those whose injury involved a fatality completed the Complicated Grief Index.

A more detailed descriptions of the measures utilised in this sample are presented within chapters 5 and 6 of this thesis.

2.4.2. Procedure

Initial recruitment was conducted while the patient was still in hospital. Lists of new injury cases were obtained by a research officer on a daily basis who then approached eligible participants on the ward to invite them to participant.

Participants were deemed eligible if their hospital admission was greater than 24 hours following traumatic injury; if they were aged between 16 and 70 years; and provided they could understand and speak English proficiently. Participants were excluded from participating if they had suffered moderate or severe brain injury. Participants were also excluded if they were currently psychotic or suicidal, were non-Australian visitors, or were currently under police guard. Participants were withdrawn from later follow-ups in the study if they were deceased or currently psychotic, or if they did not give consent to be re-contacted for later follow-up. This information was obtained by accessing eligible patient's medical records by a trained research assistant.

After obtaining written informed consent, participants were assessed using the CAPS interview and the self-report booklet prior to discharge from each trauma centre, an average of 7.2 days (SD= 9.6) after injury. However, if the participant did not wish to complete the booklet immediately following the interview, the booklet was either

collected the following day or a replied paid envelope was provided and the booklet returned via the post. Further information regarding the participant's demographics, hospital admission, and injury-related factors were obtained from consenting individual's medical records.

All participants were re-contacted three, twelve and twenty-four months post injury, by mail (Appendix F) and by phone, reminding them of their previous participation and inviting them to participate in the next follow-up. Those who agreed were sent a study pack for that follow-up via post, which contained a consent form, study information and the self-report questionnaire. Those who agreed to be interviewed were scheduled for a telephone interview, to be conducted in the following week at their earliest convenience. All phone interviews were audio-recorded for inter-rater reliability purposes and ensure ongoing adherence to study protocols, with participants who could not be contacted within two months of their 3, 12 or 24 month and six-year anniversary recorded as 'lost to follow-up'. Five percent of all CAPS and MINI interviews were rescored blind to the original scoring to test inter-rater reliability.

2.4.3. Participants

A total of 1161 participants were initially recruited to take part in the study at the acute phase. Table 2.11 shows both the Gender breakdown and total numbers of participants across the four waves of follow-up used in this thesis. Table 2.12 shows the marital status of participants across each follow-up, which stayed relatively stable over time. Table 2.13 further explores the IVS sample by providing employment status of participants across all waves of follow-up.

Table 2.11. Gender of participants across each follow-up of the IVS study

	Acute	*3month*	*12 month*
	N (%)	N (%)	N (%)
Male	855(73.4%)	729(74%)	635(73.2%)
Female	306(26.3)	256(26%)	233(26.8%)
Total	1161	985	868

Table 2.12. Marital status of participants at each follow-up assessment in the IVS Study

Marital status	*Acute (n=1165)* N (%)	*3month (n=892)* N (%)	*12month (n=786)* N (%)
Married	385(33)	346(38.8)	307(39.1)
Separated	54(4.6)	46(5.2)	39(5)
Divorced	89(7.6)	74(8.3)	70(8.9)
Never Married	370(31.8)	313(35.1)	275(35)
Widowed	13(1.1)	10(1.1)	11(1.4)
Defacto	117(10)	103(11.5)	84(10.7)

Table 2.13. Employment status of participants N(%) at each follow-up assessment in the IVS study

Work	*Acute* N(%)	*3month* N(%)	*12month* N(%)
Part time/casual	190(18.4)	165(18.4)	150(19.1)
Full time	602(58.4)	537(60)	477(60.6)
Unemployed looking for work	39(3.8)	34(3.8)	26(3.3)
Unemployed not looking for work	12(1.2)	7(.8)	5(.6)
Workers compensation	20(1.9)	17(1.9)	12(1.5)
Disability pension	52(5)	38(4.2)	34(4.3)
Volunteer	7(.7)	7(.7)	6(.8)
Student	47(4.6)	40(4.5)	35(4.4)
Home duties	24(2.3)	19(2.1)	15(1.9)
Other	38(3.7)	31(3.5)	27(3.4)

As can be seen in table 2.11, the majority of participants were male, with the proportion at recruitment, 74%, remaining stable across each time point despite a loss of study respondents. A large proportion of the sample was married (33%), with the majority engaged in fulltime work at both the acute stage (58.4%) and at the 24-month follow-up (61.9%).

Table 2.14 shows the mechanism of the injury by which participants were initially recruited into the study.

Table 2.14. Prevalence of mechanisms of injury in the IVS sample

Injury	*N*	*%*
Motor vehicle accident	512	65%
Fall	133	16.9%
Assault	50	6.3%
Work	38	4.8%
Other	55	7%

As shown, the majority of admissions to the trauma centres that resulted in recruitment into this study were motor vehicle accidents, accounting for 65% of the study population's admission injury.

Rate of PTSD and hyperarousal (CAPS)

At the acute stage of follow up, n=315 participants (27.8%) met criteria for hyperarousal. At three months, n=328 (33.2%) of the sample met criteria for hyperarousal. This percentage remained relatively stable over time, with 30.1%(n=259) meeting criteria at 12 months and 36.5% (n=302) meeting criteria at the twenty-four month follow-up.

At three months, 9.4% (n=93) participants met criteria for PTSD. This remained stable at 12-months, with 9.5% (n=82) again being diagnosed with having met criteria for PTSD. At twenty-four months, this increased, with 12% (n=100) of the sample meeting criteria for PTSD.

2.4.4. Non-responders

Due to the longitudinal nature of this sample participants were lost at subsequent stages of follow up due to normal attrition (e.g. non-consent for follow-up, inability to contact at subsequent follow-up, death). Whilst the path analysis study controlled for this loss of participants through the use of multiple imputations (discussed in Study 4), Study 3 did not use such methods. Therefore, Table 2.15 below shows the difference between those who completed the 12-month follow-up and were utilised as the study sample (N=790), compared to the non-responders who were those who were recruited and participated in the acute follow-up but were not assessed at 12 months (N=375).

Table 2.15. Differences between responders and non-responders at acute stage of follow-up in the IVS sample

Measures		Sample	Non-responders	*p*
Gender	Male	567 (71.8%)	288 (77.6%)	.04
	Female	223 (28.2%)	83 (22.4%)	
Days in hospital		M=12.46 (12.43)	M=12.26(13.89)	.658
Injury severity score		M=11.41(8.41)	M=10.25(6.73)	<.0001
Mechanism of injury	MVA	512 (64.8%)	278 (34.4%)	.844
	Non-MVA	246 (65.6%)	129 (34.4%)	
Acute quality of life measure	*Physical QoL*	M=81.12(15.66)	M=77.39 (18.99)	<.001
	Psychological QoL	M=75.80(15.57)	M=70.92(19.56)	<.0001
	Social/Relationship QoL	M=73.95(19.85)	M=71.68(22.54)	.106
	Environmental QoL	M=77.25(13.85)	M=72.89(16.79)	<.0001
	WHODAS Score	M=7.13(11.31)	M=10.32(15.43)	<.0001

As shown, responders who were analysed at 12 months differed significantly to those who were analysed at the acute stage but later lost to subsequent assessment. Non-responders were more likely to have lower Injury severity score, however, they scored significantly worse on nearly all measures of quality of life in the acute assessment phase. There were no significant group differences between responders and non-responders in terms of days spent in hospital or mechanism of injury (MVA). Thus, whilst the sample utilised was more severely injured, they had better quality of life at the acute follow up than those who opted out of the study. The results of chapter 5, therefore, may be more reflective of those who are doing better, than those who suffered worse quality of life in the initial stages and were lost to subsequent follow-up.

2.5. Summary

These large epidemiological samples provide a valuable opportunity to examine the research questions in populations exposed to a variety of traumas. The large sample sizes, variability in trauma exposure, and the use of gold-standard diagnostic measures allows a greater generalisability of the findings of each study. As is common with longitudinal studies, non- responder analysis showed some differences between the original study samples and those who were assessed at later follow-ups. In general, those who were assessed were better functioning and more socially compliant than those who were lost to subsequent follow-up, a consideration which although common must be noted when interpreting the findings of each study.

3. Hyperarousal following deployment: The impact of deployment and combat-related trauma on the presentation of hyperarousal symptoms in Australian Defence Force (ADF) members

3.1. Commentary

Assuming hyperarousal is a critical symptom cluster in the aftermath of trauma, and may be indicative of future risk for PTSD development, determining specific predictors of these symptoms is of theoretical importance and practical utility. Therefore, the aim of this chapter, was to assess what aspects of trauma (i.e the number or nature of the exposures) are the most significant predictors of meeting hyperarousal criteria (the presentation of two or more symptoms) following a military deployment. The use of a deploying military sample allowed a longitudinal analysis of symptom presentation, and enabled the effects of both current/recent trauma exposure (via deployment and combat incidents), as well as previously occurring lifetime trauma, on the presentation of hyperarousal to be examined. In addition to the prospective design of this study, this sample was of particular usefulness and relevance as it represented a predominantly healthy, non-symptomatic cohort that then went on to be exposed to a variety of potentially traumatising factors. Identifying predictors and patterns of symptom recruitment is important, because the identification of which aspects of trauma predict the onset of specific symptoms will allow the better monitoring and management of individuals who are at risk of developing further symptomatic distress following a traumatic experience.

3.2. Introduction

Hyperarousal symptoms in the military have generally been studied as a part of the broader concept of PTSD (Cabrera et al., 2007; Hermann et al., 2012; LeardMann et al., 2009; Phillips et al., 2010; Sandweiss et al., 2011; T. C. Smith et al., 2008b; T. C. Smith et al., 2009). As a consequence, there is a scarcity of literature on what predicts hyperarousal; a cluster of symptoms that have reported utility in predicting PTSD symptom severity (Schell et al., 2004), psychological distress (Marshall et al., 2006), further PTSD symptomology (Heir et al., 2010) and the maintenance of other PTSD symptom clusters following trauma (Solomon et al., 2009). Given the important psychophysiological role of hyperarousal in the course of PTSD, it is important to understand its aetiology in military populations, who are perhaps one of the most studied cohorts in PTSD literature.

Given the nature of military service which involves the prolonged and repeated exposure of individuals to a wide variety, and potentially extensive number of trauma experiences, much attention has been paid to the outcomes of various campaigns, services, roles, and combat situations (Dedert, Green, Calhoun, Yoash-Gantz, Taber, Mumford, Tupler, Morey, Marx, & Weiner, 2009; Hermann et al., 2012). In the last decade, research has turned its focus to veterans of the campaigns in Afghanistan and Iraq and the assessment of the traumas and consequences that they now face as a result of their service.

The evidence is that it is not military deployment per se that impacts negatively on military personnel, but the type of deployment (i.e. deployment to combat zones) and the nature (e.g., handling dead bodies, coming under enemy fire,) and number of deployment-related traumas experienced which predict the development of mental disorder (Fear et al., 2010; C. W. Hoge et al., 2004; C. W. Hoge et al., 2002; Iversen et al., 2008; Sareen et al., 2007). This is particularly pertinent to PTSD. For example, in a large

cohort study of US marines deployed to operations 'Iraqi Freedom' (OIF) and 'Enduring Freedom' (OEF), Larson et al (2008) reported PTSD as the *only* disorder that presented more significantly in personnel deployed in a combat capacity compared to those not deployed to a combat zone. This was supported by a recent review of PTSD research in the military, which concluded that "deployment to combat zones in Iraq and Afghanistan was associated with the development of stress reactions and PTSD" (Hermann et al., 2012, p. 4).

Other concurrent research has acknowledged the pivotal role that hyperarousal plays in the relationship between combat exposure and PTSD (Marshall et al., 2006; Schell et al., 2004; Solomon et al., 2009). These studies propose that veterans of military campaigns may be vulnerable to the development of hyperarousal symptoms specifically, by virtue of the nature of their training, and the nature of trauma in the deployed environment. Military personnel are trained to be highly vigilant, with the fight response finely honed to be as responsive as possible to potential threat (Kimble et al., 2010; Kimble et al., 2013). Being under near constant threat, and the uncertainty of the presence of the hallmark weapon of the Middle East conflicts, Improvised Explosive Devices (IEDs), challenges a range of neurobiological systems, which can manifest as hyperarousal symptomology. While being in this state of increased arousal is functionally adaptive during deployment when the threat is active, repeated exposures and deployment cycles have the potential to excessively activate this system, resulting in eventual system dysregulation (Smid, Kleber, Rademaker, van Zuiden, & Vermetten, 2013). One postulated consequence of this system dysregulation, resulting from cumulative trauma exposure, is Delayed Onset PTSD, which appears to be more common in military than other populations (Prigerson, Maciejewski, & Rosenheck, 2001; Smid et al., 2013; Smid et al., 2009).

Previous literature has suggested that personnel who have experienced prior trauma are more vulnerable to post-deployment mental disorder (Cabrera et al., 2007). In Australia, The Middle East Area of Operations (MEAO) Prospective Health Study, which aimed to assess n=3,074 Australian Defence Force Personnel pre and post deployment to the MEAO between 2010 and 2012, found that cumulative deployment exposures predicted higher symptoms of PTSD and other psychopathology post deployment, and that this effect was more pronounced in those with an extensive prior trauma history (Davy et al., 2012). These findings are consistent with the theory of sensitisation and kindling, whereby individuals progressively react to the presence of potential threat with greater intensity and ultimately develop a generalised over-reactivity to a range of stimuli in their civilian and military environments that remind them of the traumatic event (McFarlane, 2010).

While there is consistent evidence supporting the link between pre-deployment lifetime trauma, combat exposure and post-deployment mental health problems, the question of how different deployment-related traumas influence stress reactions requires further clarification. The MilHOP studies provided further evidence that the number of different trauma types experienced, as well as the total number of traumas, were associated with poorer outcomes. Additionally these studies noted that some lifetime traumas were more likely to be associated with PTSD than others (McFarlane, Hodson, Van Hooff, & Davies, 2011). The importance of trauma type in predicting PTSD symptom development has also been reported in a number of studies of civilian populations (Breslau et al., 1998; Ditlevsen & Elklit, 2012; Ehring & Quack, 2010; Forbes et al., 2012; Forbes et al., 2014; Frans, Rimmö, Åberg, & Fredrikson, 2005). Furthermore, the proposal that hyperarousal symptoms may result from an dysregulation of autonomic and sympathetic arousal in response to threat and uncertainty, suggests that some combat type exposures may be implicated more than

others (e.g. being vulnerable during combat or unable to respond in a threatening circumstance due to rules of engagement) (Kolkow, Spira, Morse, & Grieger, 2007).

The aim of this study is to determine individual and cumulative impacts of different combat and deployment-related traumas on hyperarousal symptom presentation amongst MEAO deployed personnel. Utilising a prospective study design, whereby data was collected pre and post deployment to the Middle East Area of Operations, this study offers a particular opportunity to explore how hyperarousal manifests itself pre deployment, the impact of deployment specific factors and traumatic events on the types of hyperarousal symptoms reported, as well as how the profile of hyperarousal changes following a single military deployment. Analyses will examine predictors of pre and post deployment hyperarousal, including the relative impact of different deployment experiences, combat, and previous lifetime trauma on post deployment hyperarousal specifically.

3.3. Method

3.3.1. Measures

A self-report questionnaire was used to collect all pre and post deployment data used in this study. The questionnaire was designed to capture self-reported psychological and physical health symptoms; as well as to record individual deployment related exposures and lifetime military and non-military traumatic events. At pre deployment, information pertaining to the ADF member's deployment history (country, operation, year, number of deployments, total time deployed), pre-deployment health (psychological, physical, social functioning and health risk factors) as well as measures of personality and resilience were collected. At post deployment, the same measures of mental, physical, social functioning and risk factors were obtained. Additional questions related to deployment exposures, both real and perceived, and other health hazards and threats

participants may have been exposed to on their most recent deployment to the MEAO were also asked. These measures are described in detail below.

3.3.1.1. Pre-deployment only measures

3.3.1.2. Pre-deployment trauma exposure

Estimates of lifetime trauma exposure prior to deployment to the MEAO in 2010-2012 were obtained using an 18-item self-report questionnaire, adapted from the trauma module of the Composite International Diagnostic Interview Version 2.1 (Kessler & Üstün, 2004). Participants were asked to indicate whether they had ever experienced each of the 18 traumas (e.g., life threatening accident, finding dead body), and how many times. The number of times for each of the endorsed items was then summed, to calculate the total number of times traumatised pre-deployment. The number of pre-deployment trauma *types* was obtained by dichotomously coding each trauma type as endorsed or not (regardless of number of times), then summing endorsed items.

3.3.1.3. Number of prior deployments

Participants provided a detailed account of their lifetime deployment history prior to their current MEAO pre-deployment assessment, including the number and type of war-like, peacekeeping and border patrol operations in which they had participated. These deployments were then summed to create a count variable of the total number of prior deployments, which in this sample ranged from 0 to 301, M=2.52, SD=4.59. For the purposes of analysis, this 'number of prior deployments' variable was categorised in a manner consistent with previous reports (Davy et al., 2012): no prior deployments, 1-3 prior deployments, 3-6 prior deployments, and 6 or more prior deployments.

3.3.1.4. Post-Deployment Only Measures

3.3.1.5. MEAO Deployment exposures

A 26-item questionnaire adapted from the Deployment Risk and Resilience Inventory (L. King, King, Vogt, Knight, & Samper, 2006), The King's College Gulf War Survey (Phase 11) (Unwin et al., 1999) and the Traumatic Stressors Exposure Scale (TSES-R) (Swann & Hodson, 2004) was used to determine the extent and type of traumatic events experienced on the MEAO deployment. For the purpose of this study, responses were dichotomised (i.e., no/yes) to indicate whether participants had experienced each event. These 26 trauma items were then grouped into nine broader categories of trauma exposure (e.g., coming under fire; in danger of being injured/killed) consistent with previous research (Dobson et al., 2012). These groups are outlined in Table 3.1. Finally, endorsement of each broad trauma *type* was then summed, to create a count variable of the number of deployment-related trauma types experienced, which ranged from 0 to 9.

3.3.1.6. Psychological outcomes assessed at pre- and post-deployment

3.3.1.7. Post-traumatic stress symptoms (PCL-C).

The civilian version of the PCL (PCL-C: F. W. Weathers, Litz, Herman, Huska, & Keane, 1993) comprises 17 questions which correspond with the symptomatic criteria for DSM-IV post-traumatic stress disorder. Respondents rate their experience of these symptoms by how much they were bothered by its occurrence in the past month, on a scale from 1 (not at all) to 5 (extremely). An individual symptom was deemed to have been met if a participant reported a score of 2 or higher. The symptoms scores are then summed to give a total score ranging from 17 to 85, with higher scores indicating higher

levels of PTSD symptoms. Overall, the PCL shows high levels of validity and reliability, demonstrated across many studies (McDonald & Calhoun, 2010; Wilkins, Lang, & Norman, 2011). The Civilian version of the PCL was used so as not to limit assessment to military trauma only. For the purposes of the following analyses, symptoms on the PCL were scored using DSM-IV criteria, where re-experiencing was met if one or more re-experiencing symptoms were endorsed (PCL items 1-5), avoidance and numbing if 3 or more of this symptom type were endorsed (PCL items 6-12), and hyperarousal if 2 or more hyperarousal symptoms were endorsed (PCL items 13-17). Individual symptoms within each criteria were endorsed if they scored a 2 or higher on the individual PCL item for each symptom (McDonald & Calhoun, 2010).

Table 3.1. Categories of traumatic deployment exposures in the MEAO sample

	Category	**Items in the Survey**
1	Coming under fire	Came under small arms or anti-aircraft fire
		Came under guided or directed mortar/artillery fire
		Experienced indirect fire (e.g. rocket attack)
		Experienced an IED/EOD that detonated
		Experienced a suicide bombing
		Experienced a landmine strike
		Encountered small arms fire from an unknown enemy
2	Discharging own weapon	Discharged your own weapon in direct combat
3	Unable to respond to a threatening situation	Experienced a threatening situation where you were unable to respond due to the rules of engagement
4	Vulnerable situations or fear of events	Seriously feared you would encounter an IED
		Went on combat patrols or missions
		Participated in support convoys (e.g. re-supply, VIP escort)
		Concerned about yourself or others (including allies) having an unauthorised discharge of a weapon
		Cleared/searched buildings
		Cleared/searched caves
5	In danger of being killed/injured	In danger of being killed
		In danger of being injured
6	Seeing/handling dead bodies	Handled dead bodies
		Saw dead bodies
7	Casualties among those close to you	Heard of a close friend or co-worker who had been injured or killed
		Present when a close friend was injured or killed
		Heard of a loved one who was injured or killed
		Present when a loved one was injured or killed
8	Human degradation	Witness to human degradation and misery on a large scale
9	Actions resulting in injury or death	Believe your action or inaction resulted in someone being seriously injured
		Believe your action or inaction resulted in someone being killed

3.3.2. Procedure

Participants were recruited as a part of the large-scale military study, which was conducted in collaboration with the Department of Defence between 2010-2012 and examined the impact of deployment to the Middle East Area of Operations (MEAO). All ADF personnel who deployed to the MEAO after June 2010, and returned from their deployment by June 2012 were invited to participate. In total, thirteen land based units and a ship were eligible and contacted to be a part of the study. A more detailed breakdown of the samples respective units and personnel can be viewed in the MEAO prospective Report (Davy et al., 2012).

3.3.3. Participants

The total eligible population for the MEAO Prospective Health Study was n= 3074. This consisted of those units and ships that deployed to the MEAO during the study period (2010 – July 2012). Of the eligible population, n= 1871 participants completed the pre-deployment survey. This sample was further reduced at post-deployment to the final sample used for the following series of analyses, of n=1324 personnel who had completed both the pre and post deployment surveys. Consistent with the predominance of males in the ADF in general, 85.1% of the sample (n=1127) was male, 9.6% (n=127) were female, and 5.3% (n=70) were missing this information. Ages ranged from 18 to 59 years (M=30.3, SD=8.49).

3.3.4. Data analysis

In order to first ascertain the prevalence of the individual PTSD symptoms in this sample, a breakdown of the proportion of participants who met each of the different PTSD criteria (including hyperarousal) at pre and post deployment is reported. This is followed by a more detailed examination of the hyperarousal symptom cluster, including a report of the proportion of the sample that met each hyperarousal symptom

at pre and post, and how this changed over time. Upon establishing the prevalence of hyperarousal criteria met at pre and post deployment, and which specific symptoms were met, the next step was to use a series of regressions to assess what pre-morbid and demographic factors specific to military service predicted hyperarousal being met pre-deployment.

In order to examine the effects of deployment on post-deployment hyperarousal, predictors were broken into three distinct groups; demographic and service characteristics, deployment-specific trauma characteristics and previous lifetime trauma characteristics. Each of these categories contained a number of predictors, which were first entered as both univariate and then multivariate predictors of post-deployment hyperarousal. The final model drew together all the significant predictors of post-deployment hyperarousal to see which factor had the most significant impact in predicting symptoms of hyperarousal post-deployment.

In all the univariate and multivariate analyses that examined predictors of post-deployment hyperarousal, pre-deployment hyperarousal was entered as a covariate in the model to control for the presence of pre-deployment symptoms. This allowed for the examination of the impact of deployment exposures and other predictors of hyperarousal.

3.4. Results

3.4.1. Hyperarousal pre and post deployment – presentation of symptoms

3.4.1.1. The prevalence of hyperarousal compared to the other PTSD symptom clusters

A total of n=23 (1.8%) of participants met full PTSD criteria following deployment. The proportion of the sample that met diagnostic criteria for each symptom cluster of PTSD at pre and post deployment is presented in Table 3.2 below.

Table 3.2. Proportion N (%) of personnel who met B, C, D criteria for PTSD at pre and post deployment in the MEAO prospective study

Cluster	N at pre	%	N at post	%
Re-experiencing (B)	62	4.7	121	9.1
Avoidance/numbing (C)	25	1.9	71	5.4
Hyperarousal (D)	56	4.2	154	11.6

Although the number of participants meeting criteria for all three PTSD clusters increased over time, avoidance and numbing showed the greatest proportional increase, followed by hyperarousal and then re-experiencing. Hyperarousal symptoms were the most reported symptoms post deployment, supporting the need for a closer inspection into what is causing this symptom cluster to increase from pre to post-deployment.

3.4.2. Hyperarousal criteria over time: proportion meeting hyperarousal criteria at pre and post deployment

The mean number of hyperarousal symptoms reported at pre deployment was M=.13, SD=.496, while the mean at post deployment was M=.21, SD=.755, with a t-test showing a significant increase in symptoms by M=.086 ($p<.0001$). The range of possible symptoms is 0-5, and as such these reported means are extremely low. The majority of the sample did not meet hyperarousal criteria at either time point, with the low mean number of symptoms likely reflects that the majority of the sample did not report any symptoms, or only one. It is a general convention to report whether symptom criteria have been meet, rather then the mean number of symptoms, and thus the DSM-IV criteria which was the DSM manual in practice during this data collection will be utilised, and hyperarousal criteria reported as being met if two or more symptoms are reported (American Psychiatric Association, 2000).

Most of the sample (86.4%) did not meet criteria for hyperarousal either prior to or upon returning from deployment. A total of 11.7% of the sample met hyperarousal criteria at post-deployment. Of these, 2.3% met criteria at pre-deployment also, whilst 9.4% met hyperarousal criteria at post-deployment who did not meet hyperarousal criteria before they were deployed to the MEAO.

Overall these results indicate that hyperarousal symptoms were low in this sample, however, they did show a proportional increase between pre and post-deployment.

3.4.2.1. Hyperarousal symptom structure pre-post deployment

In order to gain a clearer picture of the *type* of hyperarousal symptoms being experienced within this sample pre and post-deployment, the individual symptoms

making up the hyperarousal cluster were thus examined and are presented in Table 3.3 below.

Table 3.3 Prevalence of symptoms at pre and post deployment in the total MEAO prospective study sample

	N at pre	%	N at post	%
Sleep	103	7.8	217	16.4
Irritability	59	4.5	164	12.4
Concentration	44	3.3	114	8.6
Hypervigilance	32	2.4	77	5.8
Startle	20	1.5	68	5.1

Sleep problems were the most commonly reported hyperarousal symptom at both pre- and post deployment, followed by irritability and concentration problems. For each hyperarousal symptom, the proportion of cases at post-deployment more than doubled the proportion of cases at pre-deployment. In particular, startle response showed the greatest proportional increase in cases over time, more than tripling from 1.5% (n=20) to 5.1% (n=68).

3.4.3. Predictors of pre-deployment hyperarousal

Table 3.4 presents the results of the univariate (unadjusted) and multivariate (adjusted) logistic regressions predicting Pre-deployment Hyperarousal. The adjusted model was significant $X^2(10,N=1324)=47.32$, $p<.0001$.

Table 3.4 Univariate and multivariate predictors of pre-deployment hyperarousal in the MEAO sample

	Unadjusted				Adjusted			
	Exp (B)	Lower	Upper	Sig	Exp (B)	Lower	Upper	Sig
Female gender	2.02	.958	4.26	0.065	3.136	1.238	7.942	.016
Age	1.063	0.94	1.21	0.35	1.007	.96	1.007	.930
Rank								
Commissioned officer	REF							
NCO	1.239	0.54	2.84	0.612	1.275	.478	3.571	.601
Other ranks	1.512	0.68	3.38	0.313	1.437	.495	4.172	.505
Service								
Air force	REF							
Army	1.867	0.90	3.86	0.092	1.809	.656	4.99	.252
Navy	1.838	0.24	15.38	0.525	1.39	.157	12.346	.765
Number of prior Deployments								
1-3	1.413	.703	2.838	.332	1.453	.656	3.222	.357
4-6	2.072	.867	4.951	.101	2.161	.696	6.710	.183
6+	1.499	.477	4.708	.488	NA			
Previous lifetime trauma	1.305	1.19	1.43	<.0001	1.358	1.208	1.526	<.0001

Previous lifetime trauma was the only significant predictor of pre-deployment hyperarousal in the unadjusted models. Being female and serving in the army was also marginally significantly predictive of pre-deployment hyperarousal in these models.

The multivariate analyses, whereby all predictors were entered as covariates in the model, found females and previous lifetime traumas to be the significant predictors of pre-deployment hyperarousal. At pre-deployment, females were three times more likely than their male counterparts to meet hyperarousal criteria, whilst having previous lifetime trauma increased an individual's odds of meeting hyperarousal criteria. In the unadjusted and adjusted models, age, rank, service and number or previous deployments did not have a significant impact on hyperarousal.

3.4.4. Predictors of post-deployment hyperarousal

The following analyses provide insight into what predicted hyperarousal post-deployment to the MEAO. As there were more specific deployment related predictors of post-deployment hyperarousal compared to what was analysed for pre-deployment hyperarousal, predictors were separated into three distinct groups; demographic and service characteristics, MEAO deployment characteristics, and prior lifetime experiences. The significant predictors from each of these groups then informed what was included in the final model to establish the most significant predictors of post-deployment hyperarousal in this sample.

3.4.4.1. Demographic and service characteristics

Table 3.5 presents the results of the univariate (unadjusted) and multivariate (adjusted) logistic regressions of the unique service demographics entered as predictors of post-deployment hyperarousal. For consistency of comparison with results from the previously published MEAO prospective study (Davy et al., 2012), 'Airforce' was entered as the reference group for the service and 'Officers' were entered as the reference group for Rank.

Table 3.5 Univariate and multivariate predictors of post-deployment hyperarousal in the MEAO sample: demographics and service characteristics

		Unadjusted				Adjusted*			
	N	*Exp (B)*	*Lower*	*Upper*	*p*	*Exp (B)*	*Lower*	*Upper*	*p*
Hyperarousal at pre-deployment	154	10.645	6.1	18.58	<.0001	9.328	4.809	18.095	<.0001
Female gender	1127	1.736	0.88	3.44	0.114	.701	.315	1.571	.392
Age	NA	1.01	.99	1.03	.230	1.012	.986	1.039	.354
Rank									
Officer (reference)	245								
NCO	523	1.191	.709	2.003	.509	1.017	.568	1.821	955
Other ranks	556	1.629	.989	2.686	.056	1.855	.979	3.514	.058
Service									
Air force (reference)	330								
Army	925	2.535	1.555	4.132	<.0001	2.426	1.372	4.288	.002
Navy	69	.954	.316	2.884	.933	1.041	.332	3.262	.945
Times deployed									
1-3 times	524	1.192	.789	1.801	.405	1.171	.739	1.855	.502
4-6 times	149	1.651	.958	2.847	.071	2.347	1.235	4.458	.009
6+ times	90	.883	.400	1.947	.757	1.007	.382	2.655	.988

**Adjusted for all predictors in the model*

In the univariate models, hyperarousal at pre-deployment was the most significant predictor of post-deployment hyperarousal. Those in the army, in the lower ranks, and those with previous lifetime trauma were also significantly more likely to meet criteria of hyperarousal post deployment. Being deployed 4-6 times was significant of meeting hyperarousal criteria post deployment in the univariate analyses.

In the combined model, which was significant $X^2(10,N=1324)=73.39$, $p<.0001$. pre-deployment hyperarousal was again the most significant predictor of post-deployment hyperarousal. Those who were in the army, and deployed 4-6 times were also significantly more likely to meet hyperarousal criteria post-deployment. As was shown in the univariate analysis, being in the lower ranks was marginally significant of meeting hyperarousal criteria post-deployment.

3.4.4.2. MEAO deployment characteristics

There were a number of characteristics of the MEAO deployment that were unique and were thus entered as potential predictors of post-deployment hyperarousal. Table 3.6 below presents the univariate and multivariate analysis of role on deployment and total time away on deployment.

Table 3.6 Univariate and multivariate models of role on deployment and total time away as predictors of post-deployment hyperarousal in the MEAO sample

		Unadjusted				Adjusted*			
	N	Exp (B)	Lower	Upper	Sig	Exp (B)	Lower	Upper	Sig
Role on deployment									
Combat in I/A**	686	3.211	1.906	5.409	<.0001	3.169	1.87	5.369	<.0001
Outside I/A** (reference)	339								
Inside MSB	299	1.567	.830	2.96	.166	1.551	.819	2.937	.178
Total Time away									
>12 months	284	1.170	.715	1.913	.532	.976	.590	1.613	.925
1-6 Months	208	1.009	.575	1.771	.976	.952	.539	1.68	.865
7-12 months	289	1.368	.848	2.209	.199	1.166	.716	1.896	.537

**Adjusted for all predictors in the model **Iraq/Afghanistan*

Being deployed in a combat role in Iraq or Afghanistan emerged as the most significant predictor of Hyperarousal post-deployment in both the univariate and multivariate analyses. In the adjusted model, which was significant $X^2(7,N=1324)=90.446$, $p<.0001$, individuals deployed in a combat role were 3 times more likely to meet criteria than those deployed outside Iraq or Afghanistan. Neither being deployed inside the main support base nor the total time away on deployment emerged as significant predictors of hyperarousal post-deployment in these analyses. These results suggest that it is the nature of the combat role that had the most significant impact on individuals deployed to the MEAO.

3.4.4.3. Number of deployment exposures

Table 3.7 shows the results of a logistic regression whereby the number of exposures on deployment was entered into the model as a predictor of hyperarousal post-

deployment. Pre-deployment hyperarousal was also entered as a covariate to control for pre-deployment symptoms predicting post-deployment symptoms.

Table 3.7 Number of exposures predicting hyperarousal symptoms post-deployment, controlling for pre-deployment symptoms in the MEAO sample

Number of exposures	N	Exp (B)	Lower	Upper	Sig
1	129	2.263	0.85	6.04	0.103
2	121	2.135	0.78	5.83	0.139
3	135	2.669	1.04	6.87	0.042
4	137	3.569	1.45	8.8	0.006
5	160	4.078	1.71	9.73	0.003
6	161	3.779	1.59	8.97	<.0001
7	112	5.699	2.36	13.77	<.0001
8	80	11.933	4.96	28.7	<.0001
9	16	19.421	5.4	68.56	<.0001

The results of this analysis showed that the odds of meeting hyperarousal increased significantly after being exposed to 3 or more traumas whilst on deployment. The odds of meeting hyperarousal also increased exponentially again after 7 trauma exposures, despite the low group numbers of these higher trauma exposure categories.

3.4.4.4. Types of deployment exposures

While Table 3.7 demonstrated that the number of exposures experienced has a cumulative impact on likelihood of meeting hyperarousal criteria at post-deployment, as mentioned previously, there is also evidence that the different types of exposures experienced may be more or less important. Therefore, the following analyses examined the relative impacts of each of the 9 deployment specific exposure types on post-deployment hyperarousal symptoms. Table 3.8 below shows the results of a series of univariate and multivariate logistic regressions whereby the deployment trauma

types were entered as both univariate and covariate predictors of post deployment hyperarousal. Pre-deployment hyperarousal symptoms were entered as a covariate in each series of models to control for the effect of pre-deployment symptoms predicting post-deployment symptoms.

Table 3.8 Deployment traumas predicting post-deployment hyperarousal whilst controlling for pre-deployment hyperarousal symptoms in the MEAO sample

		Unadjusted				Adjusted*			
Deployment trauma	N	Exp (B)	Lower	Upper	Sig	Exp (B)	Lower	Upper	Sig
Vulnerable situation	886	2.654	1.64	4.30	<.0001	1.065	.522	2.174	.862
Coming under fire	918	2.66	1.61	4.39	<.0001	1.304	.643	2.647	.462
Discharging Weapon	340	1.98	1.36	2.86	<.0001	1.288	.793	2.092	.306
Threatening situation	260	2.78	1.91	4.06	<.0001	1.558	.981	2.475	.060
Danger of being killed or injured	610	2.2	1.52	3.19	<.0001	1.135	.662	1.945	.644
Seeing dead bodies	613	3.093	2.09	4.58	<.0001	2.054	1.241	3.4	.005
Seeing casualties	766	2.75	1.79	4.24	<.0001	1.329	.753	2.347	.327
Human degradation	169	3.541	2.33	5.37	<.0001	2.326	1.461	3.705	<.0001
Being injured in action	96	2.52	1.48	4.29	<.0001	1.617	.894	2.924	.112

**Adjusted for all predictors in the model*

As shown, experiencing *any* of the deployment trauma types significantly increased an individual's risk for meeting post-deployment hyperarousal. Of these deployment-related traumas, witnessing human degradation was the most significant risk factor for meeting hyperarousal criteria post-deployment, followed by seeing dead bodies, being in a threatening situation, seeing casualties, coming under fire, being in a

vulnerable situation, being injured in action, being in danger of being injured or killed, and finally discharging your weapon. These results suggest that while any traumatic deployment experience type can impact on hyperarousal, some experiences may have a greater impact than others.

The multivariate model, which was significant $X^2(10,N=1324)=128.89$, $p<.0001$, supported this hypothesis, as human degradation emerged as the most significant predictor of post-deployment hyperarousal when all trauma types were entered in the same model. Seeing dead bodies was also still a significant predictor in this model, and being in a threatening situation emerged as a marginally significant predictor in this model.

3.4.4.5. Prior lifetime trauma

3.4.4.6. Number of prior lifetime traumas

Previous lifetime trauma emerged as the most significant predictor of hyperarousal prior to deployment. Therefore, it was important to determine whether previous lifetime trauma played as significant a role on post-deployment hyperarousal, and, if so, whether it was the number or the type of previous traumas that made it such an important predictor. Table 3.9 shows the results of a logistic regression whereby the number of prior lifetime traumas was entered into the model as a predictor of hyperarousal post-deployment. Pre-deployment hyperarousal was also entered as a covariate to control for pre-deployment symptoms predicting post-deployment symptoms. The model was significant $X^2(13,N=1324)=84.223$, $p<.0001$.

Table 3.9 Number of prior lifetime traumas predicting hyperarousal symptoms post-deployment, controlling for pre-deployment symptoms in the MEAO sample

Number of prior lifetime traumas	N	Exp (B)	Lower	Upper	Sig
0 (reference)	350				
1	233	.689	.357	1.333	.269
2	191	.867	.444	1.697	.678
3	126	1.327	.674	2.613	.413
4	133	2.064	1.126	3.786	.019
5	87	1.503	.719	3.142	.279
6	60	2.316	1.078	4.975	.031
7	33	1.897	.667	5.396	.230
8	31	2.097	.755	5.825	.155
9	7	6.720	1.318	34.266	.022
10	14	5.749	1.707	19.365	.005
11	5	1.595	.14	18.204	.707

Number of previous traumas also appears to have a cumulative impact on the odds of meeting hyperarousal post-deployment, as the odds-ratios steadily increased as the number of traumas grew. Being previously exposed to four, six, nine or ten lifetime traumas emerged as significant risk factors for meeting hyperarousal post-deployment, with the nine and ten previous exposure groups conveying the most significant risk despite having very low numbers of participants in these groups.

3.4.4.7. Types of prior trauma exposure

As the number of exposure types showed a pattern of cumulative impact, it was also important to analyse the role that the *type* of previous lifetime trauma experienced by an individual played in the development of hyperarousal post-deployment. Table 3.10 show the results of the univariate and multivariate analyses where the types of traumas experienced prior to deployment were entered as predictors of post-deployment

hyperarousal. Once again, pre-deployment hyperarousal was entered as a covariate in each model, to control for the role of previous symptoms of hyperarousal prior to the deployment.

Table 3.10 Type of prior trauma exposure predicting post-deployment hyperarousal whilst controlling for pre-deployment hyperarousal symptoms in the MEAO sample

		Unadjusted				Adjusted*			
Prior trauma type	N	Exp (B)	Lower	Upper	Sig	Exp (B)	Lower	Upper	Sig
Combat	182	1.361	.851	2.178	.198	0.874	0.503	1.522	0.635
Threatening situation	349	2.067	1.426	2.997	<.0001	1.769	1.151	2.719	0.009
Disaster	426	1.775	1.232	2.558	.002	1.396	0.921	2.115	0.116
Witnessed someone being killed or injured	535	2.049	1.42	2.955	<.0001	1.459	0.902	2.361	0.124
Rape	18	1.926	.549	6.752	.306	2.347	0.531	10.373	0.26
Molestation	25	1.088	.307	3.85	.896	0.446	0.085	2.33	0.339
Attack	294	1.397	.932	2.092	.105	0.643	0.373	1.107	0.111
Physically threatened	295	1.980	1.347	2.911	.001	1.584	0.946	2.653	0.081
Threatened with weapon	131	2.481	1.535	4.011	<.0001	1.993	1.091	3.64	0.025
Tortured	5	4.079	.563	29.545	.164	2.81	0.278	28.363	0.381
Violence	78	1.325	.677	2.594	.412	1.499	0.604	3.722	0.383
Witnessed violence	181	.755	.439	1.301	.312	0.282	0.129	0.617	0.002
Found dead body	224	1.925	1.272	2.913	.002	1.303	0.774	2.193	0.319
Witness suicide	119	1.274	.723	2.245	.402	0.785	0.388	1.591	0.502
Child abuse physical	37	2.494	1.108	5.617	.027	1.409	0.374	5.305	0.612
Child abuse emotinal	50	2.329	1.138	4.764	.021	2.279	0.761	6.826	0.141
Other stressful event	57	1.504	.710	3.185	.287	0.998	0.42	2.374	0.997
Shock due to event happening to a loved one	65	.952	.437	2.074	.901	0.768	0.318	1.858	0.558

**Adjusted for all predictors in the model*

The univariate analyses revealed that a number of previous lifetime traumas were significantly predictive of post-deployment hyperarousal. In these models, threat emerged as a common factor, with being in a threatening situation, being physically threatened, and being threatened with a weapon all significantly predicting post-deployment hyperarousal. Experiencing a natural disaster, witnessing someone being

injured or killed, finding a dead body and both child abuse experiences also emerged as significant predictors in the univariate models.

In the multivariate analysis, when accounting for the effects of all trauma types, being in a threatening situation emerged as the most significant previous lifetime factor that predicted post-deployment hyperarousal. Being threatened with a weapon also emerged as significant, and being physically threatened was marginally predictive of post-deployment hyperarousal, findings which support the hypothesis that traumas involving threat would be more likely to predict symptoms of hyperarousal at post-deployment. However, these findings suggest that this is the case primarily for those experiences occurring prior to deployment, rather than exposures whilst deployed.

3.4.4.8. Final model

Table 3.11 shows the final multivariate model that includes all significant predictors of post-deployment hyperarousal that were found in the previous analyses.

Table 3.11. Multivariate logistic regression of previously significant predictors of post-deployment hyperarousal in the MEAO sample

	Exp(B)	95% C.I.		p
		Lower	Upper	
Pre-deployment hyperarousal	8.158	4.07	16.349	<.0001
Demographics				
Service				
Army	0.999	0.432	2.309	0.998
Navy	0.724	0.199	2.637	0.624
Times deployed				
1-3	0.888	0.550	1.436	0.629
4-6	1.180	0.624	2.231	0.611
6+	0.656	0.262	1.64	0.367
Deployment characteristics				
Role				
Combat in Iraq or Afghanistan	1.135	0.409	3.149	0.807
Inside main secure base	0.886	0.347	2.261	0.800
Number of exposures	1.077	0.901	1.288	0.414
Type of exposure				
Human degradation	1.918	1.067	3.447	0.029
Seeing dead bodies	1.56	0.817	2.977	0.178
Previous lifetime trauma				
Number of previous traumas	1.044	0.933	1.169	0.452
Type of trauma				
Threatening situation	1.356	0.819	2.245	0.236
Threatened with weapon	1.692	0.872	3.284	0.120

The final model, $X^2(14,N=1324)=101.455$, $p<.0001$, entered all significant predictors of post-deployment hyperarousal from the previous analyses in a multivariate regression to determine which predictor had the greatest impact on post-deployment hyperarousal. Pre-deployment hyperarousal emerged as the most significant predictor of post deployment hyperarousal, consistent with each of the previous models in which

it was included as a covariate. Human degradation also remained a significant predictor of post-deployment hyperarousal, however, using the Bonferroni correction, accounting for the number of comparisons in the model renders this finding non-significant.

3.5. Discussion

This study specifically focuses on the impact of military deployment on the presentation of the symptom cluster of hyperarousal. Previous studies have analysed the role of deployment in predicting PTSD symptoms more generally (Cabrera et al., 2007; Hermann et al., 2012; LeardMann et al., 2009; Phillips et al., 2010; Sandweiss et al., 2011; T. C. Smith et al., 2008b; T. C. Smith et al., 2009). However, previous research has not investigated the primary role of the propensity to sustained arousal as a predictor of PTSD despite recent research suggesting this is a critical cluster in predicting further disorder and symptom manifestation (Marshall et al., 2006; Schell et al., 2004; Solomon et al., 2009).

Individual symptoms of hyperarousal and deployment to the MEAO

The first objective of this study was to examine hyperarousal presentation, both pre and post deployment. Sleep was the most prevalent hyperarousal symptom pre-deployment, with 7.8% of the sample endorsing sleep difficulties. It is important to note that the majority of the sample did not have *any* symptoms of hyperarousal, or meet criteria for hyperarousal at both pre and post-deployment. This is not surprising, and is consistent with previous literature that has shown military samples to be disproportionately healthy, whereby recruitment and regular evaluation processes within armed forces remove the psychologically unfit and create a 'healthy warrior' effect (Larson, Highfill-McRoy, & Booth-Kewley, 2008). However, the proportion of participants reporting hyperarousal symptoms of all types did increase post-deployment, in line with a deployment effect. The proportion of people reporting sleep

difficulties and irritability in particular increased at post-deployment, and the overall proportion of participants who met hyperarousal criteria increased. Together, this suggests a general effect of deployment on hyperarousal, and that there may be risk factors for these symptoms in particular, that may be specific to military deployment. Given the relationship of sleep difficulties to a variety of psychiatric disorders (Breslau, Roth, Rosenthal, & Andreski, 1996; Koren et al., 2002), future research should focus on how well military personnel recover from deployment induced sleep difficulties and their possible longer-term ramifications for disorder and quality of life.

Predicting pre-deployment hyperarousal

An examination of predictors of hyperarousal at pre-deployment showed females, servicemen in the army, those in the lower ranks, and servicemen with a history of previous lifetime trauma were significantly more likely to meet hyperarousal criteria. However, when these factors were entered together as predictors of hyperarousal pre-deployment, being female and having previous lifetime trauma were the only predictors that remained significant. The finding that females were more likely to meet criteria is supported by previous literature, which has highlighted the gender differences in PTSD risk, with females being more vulnerable to PTSD symptomology than males in a variety of samples (Breslau, 2009; Resnick et al., 1993). Previous lifetime trauma being endorsed as the most significant predictor of pre-deployment hyperarousal supports previous research into cumulative trauma, in which a growing body of literature suggests that previously experienced trauma has a cumulative burden on the individual (Brewin et al., 2000), which can result in increased symptom complexity (Cloitre et al., 2009), and a greater risk of both PTSD and further psychiatric disorder (Ozer et al., 2008; Turner & Lloyd, 1995; Yehuda et al., 1995).

Predicting post-deployment hyperarousal

Demographic and service characteristics

Servicemen in the army, and those who were deployed 4-6 times were significantly more likely to meet criteria of hyperarousal post-deployment. Being deployed in a combat role in Iraq or Afghanistan also emerged as a significant predictor of post-deployment hyperarousal. These findings were not surprising, given that army personnel in this sample were more often deployed in combat roles, thus potentially exposed to more traumatic experiences and at greater risk for fear learning and sensitisation (Pitman et al., 2012). These findings also highlight that servicemen deployed in combat capacities are at greater risk for developing PTSD (Adler, Vaitkus, & Martin, 1996; T. C. Smith et al., 2008a; T. C. Smith et al., 2008b).

In all regressions, pre-deployment symptoms were entered as a covariate in the models. This method was employed to ensure that variance in post-deployment symptoms was not being influenced by pre-deployment symptoms. As expected, meeting hyperarousal criteria at pre-deployment was a significant predictor of post-deployment hyperarousal. This supports previous work by MacDonald et al., (2013) who found pre deployment hyperarousal to be significantly positively correlated with post-deployment hyperarousal in a sample of 774 US Army troops deployed to Iraq. The implications of this are that if individuals are symptomatic before they deploy, they are at particular risk of further symptomatic distress following that deployment. This suggests that subsyndromal symptoms are a risk factor for further escalation in the face of deployment trauma.

Deployment exposures

Number of traumatic exposures

The number of exposures personnel experienced whilst deployed played a significant role in predicting hyperarousal post-deployment. Those exposed to three or more traumas whilst deployed to the MEAO had significantly greater chances of meeting hyperarousal post-deployment. Sixty percent (N=801) of personnel deployed to the MEAO were exposed to three or more traumas whilst deployed, suggesting they were at significantly greater risk for meeting hyperarousal post-deployment. This supports previous literature which found deployment specific exposures are strongly associated with post-traumatic stress symptomology (Vogt, Pless, King, & King, 2005). These results provide further support for previous literature, which has found that personnel who experience more exposures whilst deployed in combat capacities are at greater risk for developing PTSD symptoms via the conditioning process which occurs as the individual is exposed to repeated adverse events (Adler et al., 1996; Blechert, Michael, Vriends, Margraf, & Wilhelm, 2007; Pitman et al., 2012; T. C. Smith et al., 2008a; T. C. Smith et al., 2008b). It is important to note that whilst 801 participants were exposed to three or more traumas and thus at greater risk of meeting hyperarousal criteria post-deployment, only 154 participants met criteria post-deployment, thus there are clearly protective factors in this sample that prevent this relationship manifesting as symptomology in all cases, although these factors are beyond the scope of this study.

Deployment specific traumas

The critical objective of this exploratory study was to assess the relationship between deployment specific factors and the development of hyperarousal symptoms. Descriptive analyses demonstrated that there was a cumulative impact of deployment exposures on likelihood of meeting hyperarousal criteria at post-deployment. When the individual impacts of different deployment exposure types were examined, each had a significant predictive association with the presentation of hyperarousal at post-

deployment. In the multivariate analyses, witnessing human degradation and seeing dead bodies were the only significant trauma types to predict post-deployment hyperarousal. This was not in line with the original hypothesis, in which threatening situations were expected to have a greater differential impact on hyperarousal symptoms. However, human degradation also emerged as the most significant predictor of hyperarousal in the final analysis, and thus it appears that witnessing human degradation confronts the individual with the reality of the threat of combat in a manner that it instils impotence and helplessness (Ward, 1997), that it is particularly traumatising and predictive of hyperarousal symptoms. Previous research has noted that witnessing atrocities, or massacres is associated with worse mental health and need for services following deployment, even when controlling for previous combat exposures, (Sareen et al., 2007).

Cognitive appraisal models suggest that individually determined beliefs and appraisals of traumatic events may be at least as important as the severity of trauma in determining symptom outcome (Olff, Langeland, & Gersons, 2005). Whilst results of cognitive studies have consistently found the perception of threat, loss, or harm to be greater associated to post-trauma symptoms or diagnosis, the use of a military sample in this study may have limited the impact of these events through the process of stress inoculation, whereby more frequent and likely exposure to these events and preparedness through training lessened the impact of threat and physical harm on this sample (Norris et al., 2002; Ozer et al., 2008). Such a hypothesis is supported by previous research into stress inoculation, which has found that survivors of similar repeated trauma exposures exhibit fewer PTSD symptoms compared to survivors of fewer traumas. Less likely, however, is the repeated exposure to such an extreme stressor such as human degradation, even amongst military personnel. Witnessing

human degradation also involves an appraisal of a less controllable traumatic event, which has also been linked to higher levels of PTSD symptoms (Ozer et al., 2008)".

Further explanation of the impact of human degradation in predicting post-trauma hyperarousal is found in the concept of moral injury. Moral injury is defined as "perpetrating, failing to prevent, bearing witness to, or learning about acts that transgress deeply held moral beliefs and expectations" (B. T. Litz et al., 2009). Witnessing acts that transgress beliefs and moral systems, such as human degradation, can be deeply scarring on many levels including emotionally, psychologically, spiritually and socially (B. T. Litz et al., 2009). The findings that human degradation was the most significant predictor of post-deployment hyperarousal further the need for more research into the treatment of those who witness morally injurious acts, and highlight the impact of these events on all symptoms of PTSD, not just the criteria's or re-experiencing and avoidance and numbing of which they are more commonly associated (Beckham, Feldman, & Kirby, 1998; B. Litz, 2012).

Previous lifetime trauma

As previous lifetime trauma was found to be a significant predictor of pre deployment hyperarousal, it was further hypothesised that there may be a significant association between previous lifetime trauma and an individual's likelihood of meeting hyperarousal criteria post-deployment. Similar to number of deployment experiences, there appeared to be a cumulative impact of number of prior lifetime experiences and meeting hyperarousal criteria post-deployment. Having experienced 4, 6, 9 or 10 previous lifetime traumas significantly increased an individuals risk for meeting hyperarousal, with the odds increasing as the number of prior experiences grew higher. Having nine previous lifetime traumas also emerged as a significant predictor in the final model, which aimed to establish the most significant predictor amongst all the

variables that were previously found to predict post-deployment hyperarousal. This is consistent with the previously published work on this sample in which individuals who had a more extensive prior trauma history were at greater risk of further symptomology through the processes sensitisation and kindling, whereby individuals exposed to a greater number of traumas develop a generalised over-reactivity to stimuli in their environments, and thus are at greater risk upon exposure to further traumatic experiences due to neurobiological dysregulation caused by the repeated exposure to threatening stimuli (Cabrera et al., 2007; Davy et al., 2012; McFarlane, 2010; Pitman et al., 2012).

The analysis of the types of previous lifetime trauma revealed that lifetime traumas involving threat were common predictors of post-deployment hyperarousal. Specifically, being in a threatening situation or being threatened with a weapon were significant predictors, and being physically threatened was also marginally predictive of post-deployment hyperarousal. These findings lend support to the previous literature that has found that traumas involving threat are significant in predicting symptoms of hyperarousal and PTSD at post-deployment through the mechanism of sensitisation and fear conditioning (Iversen et al., 2008; D. W. King et al., 1999; L. A. King et al., 2008; Vasterling et al., 2010).

There are some limitations to this study that require acknowledgement. The sample utilised was disproportionately male. Despite this reflecting a common theme in veteran combat studies, which generally report much higher rates of males than females, results may not be generalisable to female veterans who have served and deployed within the ADF. Secondly, the use of self-report measures provides obvious accuracy biases associated with the use of non-clinician administered assessment measures. Whilst the PCL is a widely used measure of PTSD symptoms, additional

research is needed using a structured diagnostic interview to establish symptoms of PTSD (MacDonald et al., 2013). Finally, the individual focus on hyperarousal symptoms as a cluster of PTSD provides little context in relation to other symptom clusters of PTSD. Thus, whilst conclusions can be made about how certain deployment exposures predict hyperarousal pre and post-deployment, it is unknown how these factors influence other symptoms of PTSD and if they are unique or common covariate predictors of PTSD symptomology in general. Future research assessing the role of these deployment specific factors in predicting all symptoms and symptom clusters of PTSD, using clinician administered assessments of PTSD symptoms would provide greater insight into how deployment traumas influence PTSD psychopathology.

This study adds to both military and the PTSD research paradigms by establishing risk factors for the development of symptoms of hyperarousal in personnel following a deployment to a combat zone. The results suggest those most at risk and therefore would benefit from careful monitoring and targeted interventions are those with previous symptoms of hyperarousal, previous lifetime trauma, and those who experience 3 or more deployment exposures (MacDonald et al., 2013). Taken together, the findings of this study provide evidence of the cumulative impact and sensitisation of both previous lifetime trauma and deployment-specific experiences in predicting hyperarousal post deployment. It is also clear that there are a number of deployment specific experiences that convey greater risk. Future research should focus on further delineating the relationship between the types and numbers of trauma and hyperarousal that was found in this study, as a possible target and measurement upon which assessment and clinical interventions could be built around to prevent further PTSD psychopathology in military populations. The mapping of individuals' cumulative trauma exposure in combination with repeated measurement and monitoring of

physiological arousal might also be an option to prevent the subsequent development of hyperarousal symptoms and further PTSD aetiology.

4. Predicting future disorder: The role of hyperarousal in predicting onset of future disorder

4.1. Commentary

Previous research has found hyperarousal to be critically indicative of future risk for PTSD development. To date, however, no research has focused on how this symptom criterion may predict episodes of other psychiatric disorder, despite the overlap of several co-occurring symptoms (i.e sleep difficulties, concentration problems and irritability). The aim of the following chapter, therefore, was to examine the role of hyperarousal in the development of new onset episodes of PTSD and other anxiety and affective disorders. Following on from the findings of chapter 9, which assessed what specific trauma factors are the most significant predictors of meeting the criteria of hyperarousal, this chapter seeks to define the impact of meeting this criteria of symptoms on an individual's psychological health over time.

The role of the hyperarousal criteria in the development of new episodes of psychological disorder following trauma was examined through the use of a large, longitudinal adult sample, who were previously exposed to a variety of trauma including a natural disaster (the Ash Wednesday bushfire). In doing so, this chapter expands the knowledge within the field of trauma-related studies, by proposing the hyperarousal symptoms as a risk factor for the development of future episodes of psychological disorder in general rather than as just a predictor of PTSD symptom, onset, maintenance and severity. The identification of these symptoms as not only shared manifestations within a variety of disorder, but also as significant risk factors for the development of these disorders, may postulate these symptoms as a reflection of an enduring reactive

state, caused by underlying neurological and biological dysregulation, that persists long after trauma and is a potential area for future research.

4.2. Introduction

A common complication of PTSD research is the observation that many individuals who appear well after a traumatic experience, reporting no or relatively few symptoms, later become unwell (McFarlane, 2010). This phenomena known as Delayed Onset PTSD, highlights the need for longitudinal research focusing on the trajectory of PTSD symptoms over time, usually many years. (B. Andrews et al., 2007; Buckley et al., 1996; Carty et al., 2006).

Hyperarousal, a physiologically based aggregation of 5 diagnostic symptoms of PTSD: sleep difficulties, irritability, concentration problems, hypervigilance and startle response, has been shown to influence the onset and maintenance of PTSD, to predict the development of the other symptom clusters of PTSD (intrusion and avoidance) and to be independently associated with impaired functioning following trauma (Marshall et al., 2006; Schell et al., 2004; Solomon et al., 2009). For example, a study of adults exposed to the World Trade Centre attacks found that the anxious-arousal symptoms (hypervigilance and exaggerated startle), appear to drive (through strong predictive relationships across three, six and eight year years of follow up) re-experiencing symptoms, whilst the dysphoric arousal symptoms (sleep disturbance, irritability/anger and concentration difficulties) appear to drive emotional numbing symptoms over time (Pietrzak et al., 2013).

Schell et al., (2004) reported hyperarousal symptoms to be the strongest longitudinal predictor of both avoidance and intrusion symptoms. Their assessment of 268 young adult victims of community violence found that hyperarousal was equally, and in some cases a stronger predictor, of avoidance and intrusion than those symptoms

measured previously at either baseline, three months, and twelve months (Marshall et al., 2006; Schell et al., 2004). They concluded that hyperarousal is a critical predictor of later PTSD, however, the precise mechanism underlying this relationship remains unclear.

The individual symptoms of Hyperarousal (in particular– irritability and sleep and concentration difficulties) also form part of the diagnostic criteria for a number of other affective and anxiety disorders. Whilst it has been postulated that this crossover in symptoms may contribute to the high level of comorbidity between these PTSD and these disorders (Blanchard, Buckley, Hickling, & Taylor, 1998; Rosen & Lilienfield, 2008; Weems, Zakem, Costa, Cannon, & Watts, 2005), it is also possible that these shared symptoms reflect disruption of shared physiological pathways that later leads to specific disorders (Blanchard et al., 1998; Heim, Newport, Mletzko, Miller, & Nemeroff, 2008; Kendall-Tackett, 2000; A. Shea, Walsh, MacMillan, & Steiner, 2005). As such hyperarousal may drive the onset of these disorders via shared biological pathways (A. Shea et al., 2005) particularly when these disorders develop post trauma.

Evidence suggests that there is a critical period following exposure to a traumatic event in which the natural stress response, manifested as heightened reactivity to stimuli within the environment, will either resolve, or progressively increase over time. As such, hyperarousal either at the time or in the immediate aftermath of a traumatic event, may be a critical determinant of an individual's risk for developing further disorder, representing an inability to modulate their acute response to stress and restore both psychological and biological homeostasis within themselves (McFarlane, 2000; Shalev, 2002). There are a number of biological mechanisms postulated to underpin these phenomena, such as fear conditioning, sensitisation, and allostatic load (Kendall-Tackett, 2000; McFarlane, 2010; Pitman et al., 2012; Veling, Hall, & Joosse,

2013; S. J. Weiss, 2007). However these are not the focus of this paper, and remain areas of future research.

Several studies have reported and association between individual symptoms of hyperarousal and disorders other than PTSD. Sleep disturbances, even in the absence of a precipitating traumatic event, for instance, have been shown to longitudinally predict anxiety and depression, alcohol and drug use, as well as suicidal behaviours (Chang, Ford, Mead, Cooper-Patrick, & Klag, 1997; Sivertsen et al., 2014; Wong & Brower, 2012; Wong, Brower, Fitzgerald, & Zucker, 2004). A population study of 14,915 individuals from the UK, Germany, Italy and Portugal found that insomnia was significantly associated with psychiatric disorder, with 28.2% of insomnia sufferers having a current psychiatric condition and 25.6% having a significant psychiatry history (Ohayon & Roth, 2003). Irritability has also been shown to be associated with disorder, including physical health problems, substance abuse and other anxiety disorders (Olatunji et al., 2010). No research, however, has examined how hyperarousal symptoms experienced following trauma impact on an individual's long-term psychiatric morbidity, in the absence of a full diagnosis of PTSD.

The current study expands previous literature by examining the role of hyperarousal in predicting the long-term (over 8 years) development of new onset psychiatric disorders beyond PTSD, following a traumatic event. By controlling for previous psychiatric disorder, a well established risk factor for future disorder (Kessler et al., 2005; Lewinsohn et al., 1994; Pine, Cohen, Gurley, Brook, & Ma, 1998), the direction of the relationship between hyperarousal and future episodes of PTSD, other anxiety and affective disorders could be established over time. In contrast to previous studies, this study utilised a structured diagnostic interview, allowing diagnosis of hyperarousal as well as PTSD, anxiety and affective disorders with significant accuracy. Furthermore,

those who met criteria for either a previous or current psychiatric disorder at the first time point excluded from the analyses in order to examine the unique role of hyperarousal without the confounding effects of previous disorder. In doing so, this exclusion also removed disorder and symptom chronicity, so that all new onset disorders were indeed new and not the re-manifestation of previous symptomology.

It was hypothesised that those who met hyperarousal criteria would be more likely to develop future psychiatric disorder, in particular anxiety and affective disorder as they share symptoms of disturbed sleep, concentration and irritability (Blanchard et al., 1998; Heim et al., 2008; Kendall-Tackett, 2000; A. Shea et al., 2005). This research has clinical implications, assisting in identifying early reactions to trauma that are associated with poor outcomes, and thus increase our ability to detect at-risk individuals beyond those with PTSD (Schell et al., 2004).

4.3. Method

4.3.1. Participants

Participants were recruited as a part of a large scale epidemiological study following-up adults from the South-East of South Australia who as children were exposed to the Ash Wednesday bushfires (SELIFE study). Initially recruited two months after the Ash Wednesday fires, the original sample consisted of 806 bushfire exposed children whose mean age at the time of exposure was M=8.44 years. An unexposed comparison sample of 725 primary school children was recruited from a neighboring socio-demographically matched region of South Australia unaffected by the bushfire. To date, there have been 5 follow-up assessments of the bushfire cohort – 2, 8, 26 months, and 20 years and 28 years following the fires and 3 follow-up assessments have been conducted on the control sample – 16 months, 20 years and 28 years following the fires. The current paper utilizes data from the Time 4 (20 year follow-up) and Time 5 (28 year follow-up)

only. For the purpose of this study, and based on previous research showing few significant differences in the long term psychiatric morbidity of these two populations as a consequence of exposure to the fires(McFarlane & Van Hooff, 2009), these two samples were combined.

4.3.2. Measures

4.3.2.1. CIDI Interview: Lifetime exposure to traumatic events

Lifetime exposure to trauma was assessed using a modified set of 10 Criterion-A events from the Composite International Diagnostic Interview (CIDI) (World Health Organization, 1997). Assessed at time 4 (20yr follow-up) these events included direct combat, life-threatening accident, fire, flood or natural disaster, witnessed someone badly injured or killed, rape, sexual molestation, serious physical attack or assault, threatened with a weapon/held captive/kidnapped, tortured or victim of terrorists, and other stressful event. In addition, seven other event types (domestic violence, witnessed domestic violence, threatened/harassed without a weapon, finding a dead body, witnessing someone suicide or attempt suicide, child physical abuse, child emotional abuse) were included based on their high prevalence in previous epidemiological surveys conducted by the authors (McFarlane & Van Hooff, 2009). Participants were asked whether they or a loved one had experienced any of these events. Additionally, they were asked the number of times they had experienced each event, and their age the first and last time. They were then asked to nominate which of these events was their worst lifetime event, their age this worst time and to provide a brief description of that event. PTSD was assessed in reference to the participant's self-nominated worst lifetime event.

Previous lifetime disorder

Lifetime psychopathology was assessed using a computerised version of the Composite International Diagnostic Interview Version 2.1 at time 4 and Version 3 at time 5. The CIDI is a structured, standardised and comprehensive interview used to assess current and lifetime prevalence of affective, anxiety and substance abuse disorders in adults, based on the Diagnostic and Statistical Manual for Mental Disorders – 4th edition (DSM-IV; American Psychiatric Association, 1994).

Diagnoses were obtained using standard CIDI scoring algorithms Consistent with DSM-IV, participants met the hyperarousal criteria for PTSD if they endorsed at least two symptoms in this diagnostic interview.

DSM-IV disorders examined in this paper were limited to the Affective and Anxiety disorders which were comparable between the CIDI 2.1 and CIDI 3.0. Participants were scored on meeting Major Depressive Episode (MDE; single or recurrent episode), Dysthymia or Major depressive Disorder (MDD), Panic Disorder (PD), Obsessive Compulsive Disorder (OCD), and Generalized Anxiety Disorder (GAD). Participants were also assessed for a history of Bipolar Disorder, Agoraphobia and eating disorders, but due to the lack of prevalence of MDE, Dysthymia and these disorders in this population they were not included in the analysis or reported in this study.

Studies have found the CIDI (2.1) to have excellent inter-rater reliability, and satisfactory test-retest reliability and validity in Australia and a variety of other settings worldwide (G. Andrews & Peters, 1998; Kessler & Uston, 2004; Wittchen et al., 1991). Equally, the CIDI version 3.0 is also well validated worldwide (Kessler & Üstün, 2004). To ensure reliability and validity in the current study, research psychologists who had extensive experience and training in telephone recruitment, interviewing and psychiatric assessment conducted the interviews. A panel consisting of a psychiatrist

and three research psychologists reviewed the scoring of structured interviews on a weekly basis.

Hyperarousal

Hyperarousal was assessed using the PTSD section of the CIDI interview at time 4. In its original format in the computerised version, the beginning of this section contains a screening question whereby participants are asked if they have experienced any symptoms related to any of the traumatic experiences they have previously reported. If they answer no, they are not asked any questions about specific PTSD symptoms, including the hyperarousal criteria. To avoid participants screening out in this way, the PTSD section of the CIDI 2.1 was administered using paper and pencil format. This allowed the interviewer to ask the questions relating to each of the 17 PTSD symptoms intensity and frequency, even if none of these 17 items were endorsed, with the symptoms asked in regards to their three worst life events. Participants who reported having two or more of the hyperarousal symptoms (sleep difficulty, irritability, difficulty concentrating, hypervigilance and increased startle response) were coded as having met hyperarousal in accordance with the PTSD diagnostic criteria of the DSM-IV.

Episodes of Disorder between Time 4 and Time 5

Episodes of disorder *between* Time 4 and Time 5 were calculated using CIDI data from both Time 4 and Time 5. For each disorder type, 12-month and lifetime diagnoses were obtained as well as their age at the end of their most recent episode. As this study was interested in only the occurrence of episodes in the eight-year period between Time 4 and Time 5, participants were coded as having experienced an episode in this period if their age at the end of their most recent episode of the disorder was greater than their age at Time 4. For example, if the participant reported having a major depressive episode at the age of 32 and their age at Time 4 was 31, they were coded as having an

MDE episode during between Time 4 and Time 5. This does not preclude individuals where the episode began prior to Time 4 providing that episode continued on after Time 4.

4.3.3. Procedure

Participants in the Time 4 and Time 5 assessments were initially recruited via letters to their households reminding them of their previous involvement in the study, followed by a telephone call. Consenting participants completed a telephone interview, lasting approximately one hour and thirty minutes, with a trained research officer, which gave details of their lifetime trauma history and both their lifetime and current (12 month) psychopathology. Participants did not receive compensation for their participation. The University of Adelaide Human Research Ethics Committee and the Australian Institute of Health and Welfare research committee approved the study protocol, and the investigation was carried out in accordance with the latest version of the Declaration of Helsinki.

4.3.4. Data analysis

Descriptive statistics were used to examine the rates of new episodes of disorder between time 4 and time 5 in participants who did and did not have previous/lifetime disorder at time 4. Participants who did not have previous disorder were also further divided into those who did and did not meet hyperarousal (D criteria) at time 4. The results are presented in the participant's section of this paper in Table 4.1 and 4.2.

An important aim of this paper was to control for previous psychiatric disorder, so that the role of hyperarousal in predicting future risk of disorder could be assessed both independent of the effect of previous psychopathology (e.g. chronicity of disorder). Thus, in order to clearly assess the impact of hyperarousal on the novel onset of

disorder, participants were excluded from the analysis if they had met criteria for a diagnosis of *any* disorder up to and including time 4.

In order to examine the nature and strength of the predictive relationship between hyperarousal and new onset disorder, univariate logistic regressions were performed for each of the DSM-IV Affective and Anxiety Disorders separately. In the second series of regressions, two well-known risk factors for disorder, gender (Bijl, Ravelli, & Van Zessen, 1998; Breslau et al., 1998; de Graaf, Bijl, Smit, Vollebergh, & Spijker, 2002), and number of different traumas (Breslau et al., 1998; Deykin & Buka, 1997; Iversen et al., 2008) were included in the model along with hyperarousal in order to account for any role they played in predicting psychopathology. Age was not included in the analysis as this was a longitudinal sample of a cohort recruited at the same age, and thus would not be a significant factor in predicting disorder due to the lack of variability in the population.

4.4. Results

4.4.1. Demographic characteristics of the final sample compared to those excluded

In total 1011 people were assessed at time 4, and 440 of those participants were successfully followed up over the eight-year period at time 5. The mean age of the sample at Time 5 was M=36.31 (SD=2.21), and they had experienced M=2.96(2.03) different lifetime trauma types. After those with a previous history of disorder at time 4 were excluded, n=329 participants were analysed. The demographic characteristics of this sample and those who were excluded are displayed in Table 4.1. Table 4.1 highlights the chronicity of disorder across time, with those who had a previous disorder having a

much higher prevalence of disorder in the follow up period in comparison to the group who had no disorder.

Table 4.1 Characteristics of the final SELIFE sample and those excluded from the analysis (those with previous lifetime disorder)

Demographic		Excluded	Final Sample	P-Value
		N=111	N=329	
		N (%)	N (%)	P
Age		36.42 (2.39)	36.27 (2.15)	.538
Gender	Male	32	162	<.0001
	Female	79	167	<.0001
Original group	Bushfire	57	165	.913
	Control	54	164	.913
Mean number of different traumas		3.5	2.8	.001
Major Depressive Disorder		31 (27.9)	14 (4.3)	<.0001
Post Traumatic Stress Disorder		16 (14.4)	12 (3.6%)	<.0001
Panic Disorder		14 (12.6)	7 (2.1)	<.0001
Obsessive Compulsive Disorder		13 (11.7)	5 (1.5)	<.0001
Generalised Anxiety Disorder		16 (14.4)	8 (2.4)	<.0001

4.4.2. Rates of psychiatric disorder in those with and without hyperarousal

As can be seen in Table 4.1, the final sample (including only those with no psychiatric disorder prior to T4) was comprised of 49.2% (n=162) men and 50.8%

(n=167) women. The average age of this sample was M=36.27 years (SD=2.15). The division of these young adults who were originally recruited from the original bushfire and control samples in the study as children was roughly equitable (50.2% and 49.8% respectively), with a mean number of M=2.8 (SD=1.83) different lifetime traumas up to and including time 5. Thirty men and fifty-five women (total N=85, 25.8% of the sample) met criteria for hyperarousal at time 4, which was reported in relation to one of their three worst reported events in the CIDI interview. Those who met hyperarousal had experienced a significantly higher average of M=3.56 trauma types (SD=2.14) compared to those who did not meet hyperarousal criteria M=2.43(SD=1.61), $p<.0001$. Table 4.2 below shows the prevalence of episodes of disorder between time 4 and time 5 in those with and without hyperarousal.

Table 4.2 Rates of disorder between time 4 and time 5 in those who did and did not meet hyperarousal criteria at time 4 in the SELIFE study

	No Disorder N=329		
	No Hyperarousal N=241 (73.3%)	Hyperarousal N=88 (26.7%)	
Disorder	N (%)	N (%)	*p*
Affective Disorder			
Major Depressive Disorder	7 (2.9)	7 (8)	.06
Anxiety Disorders			
Post Traumatic Stress Disorder	5(2.1)	7 (8)	.02
Panic Disorder	4 (1.7)	3 (3.4)	.39
Obsessive Compulsive Disorder	2 (.8)	3 (3.4)	.12
Generalised Anxiety Disorder	4 (1.7)	4 (4.5)	.22

Results show a significantly higher prevalence of PTSD and a marginally significantly higher prevalence of MDD in the follow-up period in those who met hyperarousal than those who did not, thus it appears that meeting hyperarousal at time 4 appears to be a risk factor for these disorders in the follow-up period and requires closer inspection.

4.4.3. Hyperarousal as a predictor of new onset disorder

The results of univariate logistic regressions examining the role of hyperarousal as a predictor of episodes of DSM-IV affective and anxiety disorders between Time 4 and Time 5 are presented in Table 4.3.

Table 4.3 Univariate logistic regressions examining hyperarousal at time 4 as a predictor of novel episodes of disorder between time 4 and time 5 in the SELIFE sample

Disorder	*N*	*Exp (B)*	*p*	*Lower*	*Upper*
Affective Disorder					
Major depressive disorder	14	3	0.046	1.02	8.821
Anxiety Disorders					
Post Traumatic Stress Disorder	12	4.236	0.016	1.307	13.728
Panic Disorder	7	2.168	0.318	0.475	9.89
Obsessive Compulsive Disorder	5	4.372	0.11	0.718	26.626
Generalised Anxiety Disorder	8	2.926	0.135	0.715	11.969

The first series of univariate analyses revealed that meeting hyperarousal criteria at time 4 was a significant predictor of new episodes of Major Depressive Disorder and PTSD in the eight-year follow-up. Hyperarousal did not have a statistically significant impact in predicting episodes of PD, OCD, GAD. It is important to note, however, that despite the low prevalence of new disorders in this period, hyperarousal appears to have a strong effect, although not statistically significant, in predicting future disorder. Due to the low prevalence of these disorders, it is difficult to reach statistical

significance. However, in a sample with a greater prevalence of disorder and/or a higher number of eligible participants from which to obtain data, the findings indicate the likelihood that many of these disorders may in fact be significantly predicted by hyperarousal.

To further analyse the role and strength of hyperarousal as a predictor of future episodes of disorder, a second series of multivariate logistic regressions was conducted to include commonly established covariates of future disorder risk. The covariates included in the models were gender and number of different lifetime traumas, which were chosen due to their established nature as common risk factors for future disorder in epidemiological samples. Due to the lack of prevalence of the other anxiety disorders included in the univariate models, these disorders were grouped together into the 'Other anxiety disorders' category in an attempt to increase statistical power in the models. The results are presented below in Table 4.4.

Table 4.4 Results of multivariate logistic regressions with hyperarousal, gender and number of traumas entered as covariate predictors of novel episodes of disorder between time 4 and time 5 in the SELIFE sample

Disorder	*Exp (B)*	*P*	*Lower*	*Upper*
MDD				
Hyperarousal	2.597	0.123	0.772	8.734
Gender	0.769	0.659	0.239	2.468
Number of different traumas	1.208	0.136	0.942	1.548
PTSD				
Hyperarousal	1.613	0.469	0.442	5.881
Gender	15.319	0.014	1.746	134.433
Number of different traumas	1.49	0.004	1.136	1.954
Other anxiety disorders				
Hyperarousal	2.722	0.105	.812	9.12
Gender	0.757	0.639	0.237	2.422
Number of different traumas	1.169	0.227	0.907	1.506

In relation to PTSD, there were two statistically significant relationships that emerged in the second series of regressions; gender and the number of different traumas experienced. Despite the wide confidence interval, which suggests the unreliability of this result, the direction of the effect for gender where women were fifteen times more likely than men to have a new episode of PTSD suggests that women

certainly have an increased risk, though the extent of this risk is not clear in this analysis. Further, those who experienced a greater number of different traumas were significantly more likely to have a new episode of PTSD between time 4 and time 5. This is not surprising given the established strength of the predictive relationship between these two factors and episodes of PTSD, however it is significant that these covariates only had a significant impact on PTSD and not the other disorders in these analyses.

In contrast there were no significant effects for MDD, or the other anxiety disorders combined. Despite this, a similar pattern of prediction to the univariate analyse emerged for both disorder groups. Whilst non-significant, the findings of the second analysis indicated that meeting hyperarousal increased the likelihood of future disorder for the disorders other than PTSD, having a large effect within the logistic regression models as observed in table 4.3. These findings, coupled with the univariate results, suggest that in a larger sample with a higher prevalence of disorder, hyperarousal may emerge as a statistically significant predictor of disorder.

4.5. Discussion

The aim of this study was to identify the role of hyperarousal as a predictor of future episodes of psychiatric disorder utilizing a sample with no prior history of disorder. Participants were recruited as a part of the longitudinal follow-up of young adults from the South East of South Australia, who in early childhood were recruited as part of a large longitudinal population study of children exposed to the Ash Wednesday bushfires. For the purposes of the analysis, participants with previous disorder were removed from the data to leaving 329 participants with no prior disorder history who could be analysed longitudinally. Of these participants, n=85 (25.8%) met criteria for hyperarousal, and 14.6% of participants (n=48) went on to present with a novel episode of disorder in the follow-up period of eight years.

Results of the first univariate regressions showed that hyperarousal was a statistically significant predictor of episodes of Major Depressive Disorder and PTSD occurring in the eight-year follow-up. Previous studies have suggested that the co-occurrence of PTSD and Depression following a traumatic event can partly be accounted for by the obvious overlap between the symptoms of PTSD and other disorders, (i.e. the C criteria of PTSD (Social withdrawal and loss of pleasure) being very similar to symptoms of Major Depressive Disorder) (Rosen & Lilienfield, 2008; Weems et al., 2005). However, PTSD and MDD also differ in relation to the types of symptoms endorsed following trauma (PTSD participants showed greater elevation in heart rate, increased startle response, and higher levels of insomnia, compared to those with MDD), suggesting that they represent unique post-trauma trajectories despite the overlapping symptoms (Shalev et al., 2014). Our finding, that symptoms of hyperarousal in those without previous disorder are predictive of future episodes of depression *and* PTSD, suggest that symptoms of hyperarousal following trauma may instead reflect a state of dysregulation activated by the experience of trauma; in this way an individual's loss of homeostatic regulation reduces their capacity to modulate their responses to stimuli and stressors in their environment, creating a generalized risk for the future onset of new episodes disorder (Kendall-Tackett, 2000; McFarlane, 2000; Shalev, 2002; Veling et al., 2013).

To further explore the role and significance of hyperarousal as a predictor of future disorder, a second series of multivariate analyses were conducted which included two established risk factors for disorder following trauma; gender and number of different lifetime traumas. In these regression models, only new episodes of PTSD were significantly predicted by both gender and number of different traumas, with hyperarousal dropping out as a statistically significant predictor in all of the models.

The finding that women were significantly more likely to develop PTSD has been well documented, however, the underlying mechanism for this widely observed phenomena is still debated within the field (Cortina & Kubiak, 2006; Creamer, Burgess, & McFarlane, 2001a; Ditlevsen & Elklit, 2010, 2012; Kessler et al., 1995; Stein et al., 1997). Suggestions include the number of lifetime traumas and the types of traumas different genders are more likely to experience in their lifetime, however these were beyond the scope of this paper.

The number of different lifetime traumas also played a significant role in predicting new onset PTSD, and has been previously established as a significant predictor of PTSD (Mueser et al., 1998; Vrana & Lauterbach, 1994). Often referred to in the literature as multiple or cumulative trauma, experiencing a number of different traumas is associated with the reporting of a higher number and more severe symptoms of PTSD: a dose response effect whereby as an individual experiences more trauma they are further sensitised to experience adverse reactions to stimuli in their environment, thus placing further cumulative burden on their allostatic load (Green et al., 2000; Suliman et al., 2009).

As the previous chapter in this thesis highlighted the cumulative impact of previous lifetime trauma in predicting symptoms of hyperarousal, it is also plausible that including the number of previous trauma experiences in the second model have influenced the relationship that appears to exist between hyperarousal and episodes of disorder, resulting in a loss of effect due to multicollinearity. That is, the greater number of traumas experienced by individuals who met hyperarousal criteria may at least partially explain the relationship between these symptoms and PTSD. Further, the impact of new traumas within the eight-year follow-up period (between T4 and T5) may have influenced the occurrence of new episodes of disorder, and was not controlled for

in these analyses. This was not possible due to the way lifetime trauma is assessed by the CIDI, in particular that there was no fixed date of when specific traumas would have occurred between time 4 and time 5. Interestingly, this was only the case for prediction of PTSD. In the case of other disorders, whilst not statistically significant, the patterns in the data suggested that meeting hyperarousal criteria at time 4 conveyed risk for future affective and anxiety disorder development. That gender and trauma history did not appear to be as relevant in these models is most likely dude to the lack of prevalence of these disorders in the sample rather than any unique relationship to PTSD onset, as a variety of literature has found a that gender and number of traumas are indeed risk factors for future depression and anxiety (Bruce et al., 2008; Dulin & Passmore, 2010; Heim & Nemeroff, 2001; Kessler et al., 1994; Suliman et al., 2009).

Whilst not reaching statistical significance in the multivariate analysis, both the univariate and multivariate models showed a positive effect for hyperarousal as a risk factor for developing future episodes of disorder. Previous literature has linked individual symptoms of hyperarousal to the development of other psychopathology, particularly those that result from the dysregulation of the stress-activated systems (Flier, Underhill, & McEwen, 1998; Streeter, Gerbarg, Saper, Ciraulo, & Brown, 2012; S. J. Weiss, 2007). Measures of hyperarousal in each of these systems are varied and complex, however, it is the loss of homeostasis within a range of systems that has been linked to disorders ranging from the psychiatric (depression, PTSD), to neurologic (epilepsy and chronic pain), cardiovascular (hypertension), metabolic (diabetes) and immune (infection, inflammation) (Streeter et al., 2012). This study contributes significantly to the existing literature by highlighting the potential association between the DSM-IV construct of hyperarousal (as opposed to the individual symptoms of hyperarousal which has been the focus of most previous research), and new onset disorder other than PTSD. Further exploration of hyperarousal and the associated

underlying dysregulation of these various stress systems will provide further knowledge of shared disorder pathways and potentially highlight areas for clinical practice to screen individuals who are at risk or suffering from dysregulation based on these simpler, more readily administered and cost effective symptom profiles.

The duration of time between follow-ups is a limitation of these analyses. Eight years is perhaps too long between measures of symptoms and outcomes to determine the true nature of the relationship. It is entirely plausible that hyperarousal symptoms could remit or patients would seek professional treatment within such an extensive timeframe, thus more research is needed to analyze how the symptoms of hyperarousal predict disorder in the shorter term and across multiple assessments. The results support the hypothesis that hyperarousal did predict the onset of new episodes of disorder over such a long time frame. Indeed as hyperarousal was shown to predict the onset of disorder over the eight-year time frame, the assessment of hyperarousal presence in a presenting patient could be targeted as a predictor of future psychopathology. The results of this study were strengthened by the use of clinician-based assessment of hyperarousal symptoms and lifetime psychopathology. However, more research is required to delineate whether symptoms of hyperarousal represent a unique risk for future episodes of disorder, or whether this phenomena is more attributable to the overlap of symptoms within their respective diagnostic criteria. Analyses, which employ both the individual symptoms of hyperarousal and potential factors within the criteria comprising a number of the hyperarousal symptoms will further highlight the role of this criteria and its symptoms in predicting both PTSD and other novel psychopathology following trauma.

In summary, further research is required to delineate the role of hyperarousal, previously shown to predict future symptom onset and maintenance within the disorder

of PTSD, as a predictor of future risk of other psychiatric disorders. It appears that hyperarousal, in individuals without a history of previous disorder, may represent an enduring reactive state that persists long after trauma, leaving individuals more vulnerable to future episodes of psychological disorder. However, the strength of this effect compared to previously established predictors of disorder, such as number of traumas and gender, remains to be fully defined and understood. Clinically, this research indicates the need for further research into the potential to screen for symptoms of hyperarousal as a reflection of those who may be at greater risk for not only the onset of PTSD but also for episodes of other psychological disorders.

5. Quality of Life and Impairment 12 months post-injury: The contributions of PTSD criteria B, C and D.

5.1. Commentary

Previous chapters of this thesis established that lifetime and in particular, cumulative trauma, increased the risk of developing hyperarousal symptoms, and that satisfying the DSM-IV criteria for hyperarousal is a significant risk factor for future novel episodes of both PTSD and other anxiety and affective disorders. The next chapter builds on the developing paradigm of hyperarousal as the critical determinant of post-trauma sequelae by assessing the impact of meeting the hyperarousal criteria on an individual's post-trauma quality of life and disability.

In this chapter, the relationship between each of the three symptom criteria's of PTSD (hyperarousal, re-experiencing and avoidance and numbing) and impairment on measures of physical, psychological, social and environmental quality of life following a traumatic injury will be examined using longitudinal data from the Injury Vulnerability Study. The use of symptoms assessed in the acute aftermath of trauma as predictors of quality of life and disability in the latter stages of recovery, which in this study was at 12 months post-injury, provides a greater insight into the long-term consequences of these symptoms following trauma. By identifying which symptom criteria is most consequential to post-trauma quality of life, this study will allow for a greater treatment focus on the symptoms causing the greatest impediment to recovery and restoration of everyday functioning following trauma.

5.2. Introduction

Recent research has shown a strong link between posttraumatic stress disorder and

functional impairment. However the mechanism by which different PTSD symptom types (Hyperarousal, Avoidance and Numbing, and Re-experiencing) contribute to the severity and type of functional impairment in trauma-exposed individuals remains largely unclear (O'Donnell et al., 2005). The current study examines the relative contribution of each PTSD symptom criteria to impairment in physical, social, psychological and environmental functioning in 790 adult survivors of traumatic injury, using the gold standard Clinician Administered PTSD Scale. This sample was recruited as part of a larger 6-year longitudinal study into injury admissions to one of four major trauma hospitals across Australia, with the current study utilising data collected 12 months post-injury. Results showed that hyperarousal was the most significant predictor compared to other PTSD symptom criteria, and second only to self-reported pain as the strongest predictor of poorer outcomes in all areas of quality of life and functioning in individuals following a traumatic injury. These findings highlight the role of hyperarousal as a primary driver of post-trauma impairment, and the need to focus on reducing these symptoms more stringently during post-trauma clinical interventions to prevent further psychological burden and disability post-trauma.

Posttraumatic stress disorder (PTSD) has been associated with a broad profile of functional impairment (Maguen et al., 2009; O'Donnell et al., 2005; Olatunji, Cisler, & Tolin, 2007; Rodriguez, Holowka, & Marx, 2012; Schnurr, Lunney, Bovin, & Marx, 2009), with PTSD diagnostic Criterion F specifically reflecting impaired function. However, employment, family relationships, social functioning, substance abuse, mood, and a wide variety of other psychosocial factors are also reported to be impacted by exposure to a traumatic event, even *in the absence of* a PTSD diagnosis (Maguen et al., 2009; Norman, Stein, & Davidson, 2007; O'Donnell et al., 2005; Rodriguez et al., 2012; Zatzick, Jurkovich, Gentilello, Wisner, & Rivara, 2002). The International Classification of Functioning,

Disability and Health highlights the potential clinical relevance of functional impairment even in the absence of a diagnosable disorder (Organization, 2001). Furthermore, the burden of disease across numerous domains has been well documented (Boonen, Rasker, & Stucki, 2007; Gadermann, Alonso, Vilagut, Zaslavsky, & Kessler, 2012; Kessler et al., 2009).

In addition to being part of general diagnostic criteria for PTSD, previous literature suggests that each of the three primary symptom clusters of PTSD may have a differential impact on functional impairment. Re-experiencing symptoms, for example, are reported to be predominantly associated with alcohol abuse (Pietrzak, Goldstien, Malley, Rivers, & Southwick, 2010), while, avoidance, numbing and hyperarousal are associated with problems with intimate relationships, friendship and socialising, parenting, work and academic performance (Rodriguez et al., 2012). Avoidance and numbing symptoms in particular have also been linked to chronicity of PTSD symptoms and poorer response to psychological interventions (Pietrzak et al., 2010). Finally, hyperarousal has also been associated with suicidal ideation (Suris, Link-Malcolm, & North, 2011), alcohol use and marital violence (Savarese, Suvak, & King, 2001). In addition, avoidance and numbing criteria emerge as the strongest overall predictor of impairment. However, the results of many of these studies are limited by the use of diagnostic criteria outlined in the DSM-IV. For example, in DSM-IV, the number of symptoms required to meet the avoidance and numbing criterion (3 symptoms) is greater than the number of symptoms required to meet both the re-experiencing (1 symptom) and hyperarousal (2 symptom) criteria. This may partially explain the predominance of the avoidance and numbing symptoms in the prediction of functional outcomes; individuals meeting this criterion may be likely to have more functional impairments primarily due to having more symptoms. This diagnostic issue has resulted in the avoidance and numbing criteria being referred to in some studies as the

'gatekeeper' to PTSD and therefore a 'rate-limiting' factor in epidemiological studies of PTSD (Breslau, Reboussin, Anthony, & Storr, 2005; Heir et al., 2010; North et al., 1999; North, Suris, Davis, & Smith, 2009). It could also be argued that avoidance and numbing are the last symptoms to appear as PTSD develops, and as such reflect behaviours that are a consequence of the disorder, and in that way reflect functional impairment.

Acknowledging the inherent bias in diagnostic criteria, Heir et al (2010), employed PTSD symptom counts (summary scores), rather than categorical groupings for each of the PTSD symptom clusters, in order to examine functional impairment in a sample exposed to the 2004 South-East Asian tsunami. Interestingly, using this methodology they found the hyperarousal symptom criterion to be more closely linked to indicators of psychopathology and functional impairment than the avoidance and numbing criterion, supporting the need to further challenge existing research paradigms in this field (Heir et al., 2010). This study, which utilised a self report measure of PTSD, was the first to posit the apparent central role of avoidance and numbing as an artefact of diagnostic criteria, rather than as a significant predictor of functional impairment as previously stated in the literature (Breslau et al., 2005; North et al., 1999). However, as yet, their methodology of using symptom summary scores rather than diagnostic cut-off scores has not been applied to functional impairment following any other trauma type.

Previous published studies on the cohort who are the subject of the current study have found that; in the 12 months post-trauma, 22% of participants reported a new psychiatric condition; functional impairment, rather than mild traumatic brain injury, was more associated with psychiatric illness (Bryant, O'Donnell, et al., 2010; Bryant, O'Donnell, et al., 2011); participants were at an increased risk for all types of trauma and psychiatric diagnoses (O'Donnell et al., 2009a); and PTSD and depression at 1 week and at 3 months after injury significantly increased the risk of disability at 12 months (O'Donnell et al., 2004). Most pertinent to this study, however, was the finding that an

individual's acute psychological response directly predicted both the level of disability and QOL at 12 months (O'Donnell et al., 2005). The current study aims to further the work by Heir et al (2010) by analysing the impact of re-experiencing, avoidance and numbing and hyperarousal symptoms on quality of life, 12 months after injury.

The current study aimed to replicate the methodology of Heir et al (2010), to examine the contributions of hyperarousal, re-experiencing and avoidance and numbing criteria to functional impairment in a sample of traumatic injury survivors. However, in order to overcome the diagnostic shortcomings of the previous work, PTSD criteria in the current study was examined using the gold standard Clinician Administered PTSD Scale (CAPS) 12 months post injury, compared to the less accurate self reporting of symptoms which was utilised by Heir et al (Heir et al., 2010). By utilising summary symptom scores, and accounting for PTSD diagnosis and other factors that are typically related to improved quality of life outcomes (marital status, employment status and age), this study aimed to examine the role that each symptom cluster played in impacting quality of life and disability outcomes 12 months following injury.

5.3. Method

5.3.1. Participants

The sample used in this study were part of a large-scale study of longitudinal psychopathology following a traumatic injury (O'Donnell et al., 2004). In the larger study, 1,165 adults admitted to one of four level-one trauma services located in the major hospitals of Victoria, New south Wales and South Australia were recruited immediately post injury (acute assessment) and were followed up over a period of 6 years (N=832). This paper specifically focuses on the 12-month assessment data only and therefore includes 790 participants from this total acute cohort.

The demographic characteristics of the sample used in this paper are as follows. Seventy one percent of the participants were male (71.8%, N=567) and 28.2% were female (N=223). The mean age of participants at the time of their injury was 39 years (SD=13.63), thus the mean population age was 40 years old (SD= 12.43) 12-months post injury. The mean stay in hospital was 12 days, with the majority of cases admitted due to motor vehicle accidents (65%, N= 512) (see table 5.1). Half of the sample were either married or defacto (living together), and the other half reported being single. Ninety percent of the sample was employed at the 12-month follow-up. The average reported pain in the last two weeks, at the twelve month follow-up was M=2.41 (SD=2.45) (range 0-10). A comparison of participants included in this study (responders) and the entire acute cohort (non-responders) revealed a similar distribution of males (73.6%) and females (26.4%), married (48.8%), and employed (88.9%) in the sample.

Table 5.1. Mechanism of injury in the 12 month IVS follow-up sample

Injury	*N*	*%*
Motor vehicle accident	512	65%
Fall	133	16.9%
Assault	50	6.3%
Work	38	4.8%
Other	55	7%

5.3.2. Measures

5.3.2.1. PTSD Criteria and Diagnosis

Twelve month DSM-IV PTSD in relation to the hospitalisation injury was assessed using the Clinician Administered PTSD Scale-IV (CAPS), a structured clinical interview that uses a four-point scale to assess the frequency and intensity of the 17 PTSD symptoms (Blake et al., 1995). To score the CAPS, a '1-2' system was adopted so that the

'presence' of a symptom was indicated by at least a frequency score of 1 and an intensity of 2 (thus it was causing at least moderate distress) (Blake et al., 1995). The CAPS has good test-retest reliability (0.90), sensitivity (0.84) and specificity (0.95) (Blake et al., 1995). Summary scores for each of the PTSD criteria, Intrusion (B), Avoidance (C) and Hyperarousal (D), were calculated by summing the number of symptoms which were 'present' 12 months post trauma. Consistent with DSM-IV criteria a participant was determined to have PTSD at 12 months if they endorsed one or more re-experiencing symptoms, three or more avoidance and numbing symptoms, and two or more hyperarousal symptoms.

5.3.2.2. Quality of Life

Quality of life 12 months post-injury was assessed using the World Health Organisation-Quality of Life brief, a 26-item quality of life questionnaire with a five level response scale (1-5) for each question (WHO-QOL bref: WHOQOL Group, 1996). An abbreviated version of the WHOQOL-100 quality of life assessment, the WHOQOL-Brief measures four domains of life quality including physical health (Energy levels, sleep, daily activities), psychological health (life enjoyment, life meaning, concentration), social relationships (personal relationship, sex life, friendship), and environment (conditions of living, accessibility, safety) (WHOQOL Group, 1996). Previous research demonstrates good discriminant validity, content validity, internal consistency and test-retest reliability (Harper & Power, 1998). A scoring algorithm was used to transform scores onto a 0-100 scale, which is the way they are typically reported in the literature (WHOQOL Group, 1996). Participants were asked to rate their quality of life over the past two weeks. For the quality of life measures, lower scores correspond to poorer quality of life.

5.3.2.3. Disability

Disability twelve months post-trauma was assessed using The World Health Organisation-Disability Assessment Scale (WHODAS), a 12 item scale with a five level response scale (None to Extreme) (WHO-DAS 12: WHODAS Group, 2000). It assesses the activity limitations and participation restrictions experienced by an individual irrespective of their medical diagnosis. Composed of items taken from the longer, 36-item WHODAS, the scale assesses restrictions across 6 domains: Understanding and communicating, getting around, self care, getting along with people, life activities and participation in society. The WHO-DAS 12 is composed of two questions in each of these domains, with higher scores on this scale reflecting poorer functioning.

5.3.2.4. Pain Visual Analogue Scale– average pain self-reported in the last two weeks related to admission injury

Pain is measured using a single-item visual analogue scale whereby pain intensity is self-reported by the participant on a scale ranging from 0 - "no pain" to 10 - "pain as bad as it could be" or "worst imaginable pain". The VAS scale has been used in a variety of adult populations, and was used in this study as a self reported measure of average level of pain in the last two weeks relating to their initial admission injury.

5.3.3. Procedure

All participants provided informed, written consent both in the acute phase and at the 12-month follow-up. At 12 months following injury, participants were contacted by telephone and asked if they wished to continue in the next phase of follow-up survey and interview. Those who consented were sent a study pack containing relevant study information, the study questionnaire containing the WHOQOL and WHODAS, as well as a consent form to be returned via pre paid post. Participants were then re-contacted approximately one week later by telephone and administered the CAPS by trained

interviewers to assess prevalence of PTSD symptoms in relation to their original hospitalisation injury. The original recruitment and assessment methodology for earlier phases of this study has been reported elsewhere (O'Donnell, Elliot, et al., 2007). All interviewers were trained in the administration of the CAPS according to the technical manuals and scoring protocols. All interviews were recorded for quality control purposes. Inter rater reliability was examined with diagnostic consistency between assessors on the CAPS acceptable (0.98).

5.3.4. Data Analysis

The statistical package SPSS Statistics 21 was used for the following analyses.

Descriptive analyses (M, SD) are provided for the quality of life and functional outcome measures of interest. Scores on these measures were compared between individuals with and without a PTSD diagnosis at 12 months post-injury using t-tests.

Following this, a series of multivariate linear regressions (Table 5.3) examined the relative impact of PTSD and each of the 3 primary PTSD criteria (intrusion, hyperarousal, avoidance/numbing) on quality of life and functional outcomes. In these models DSM-IV symptom scores for each symptom cluster, and PTSD criteria diagnosis were entered as multivariate predictors of quality of life and disability.

To further delineate the relative impact of each individual symptom cluster and assess how they compare as predictors of quality of life, a second series of multivariate regressions were conducted. In these analyses, each DSM PTSD diagnostic criteria (intrusion, avoidance, hyperarousal) and PTSD diagnosis were entered together in the models, along with other potential covariates including age at time of admission, marital status, employment status, average self-reported pain score in the past two weeks (VAS), and gender. These adjusted regressions are reported in Table 5.4. Preliminary analyses were conducted to assess linearity, multicollinearity and homoscedasticity in

the data. Utilising the cut-offs provided in Tabachnik and Fidell (2007), correlation outputs were examined (no variables correlated >.07), tolerance for all models >.10 and VIF for all models <10. Mahalanobis Distance was also satisfied (in both series of analyses, no cases exceeded the critical values of 18.47 and 27.88 respectively), for all of the models, thus confirming there was no violation of linearity, multicollinearity, and homoscedasticity. In the second analysis, the problem of multiple comparisons was accounted for using the Holm-Bonferroni method.

5.4. Results

Table 5.2 provides means and standard deviations of each of quality of life (QoL) and disability outcome for the whole sample (N=768) and for those with (N=68, 8%) and without PTSD (N=699).

Table 5.2 Mean (SD) of functional outcomes for the whole IVS sample, and for participants with No PTSD and PTSD at 12-months post-injury

	Whole sample (n=768) M (SD)	No PTSD at 12-motnhs (n=699) (M, SD)	PTSD at 12-months (n=68) (M, SD)
Physical QoL	66.55 (21.37)	69.07 (19.95)	40.6 (18.7)
Psychological QoL	65.81 (19.52)	68.5 (17.69)	38.53 (16)
Social QoL	66.49 (22.91)	68.9 (21.55)	41.67 (21.79)
Environment QoL	69.59 (16.40)	71.43 (15.17)	50.69 (16.77)
DAS score	21.38 (20.60)	18.75 (18.83)	48.15 (18.7)

*** *All differences between PTSD and no PTSD groups on QoL outcomes were significant to p<.0001*

The differences between the PTSD and non-PTSD groups were significant for each quality of life and disability scale at p<.0001, with poorer quality of life and more

disability for PTSD compared to non-PTSD cases. Participants with PTSD reported significantly lower functioning scores on all domains of functioning compared to those without PTSD. The domain of functioning that was most impaired in the PTSD group was psychological QOL, followed by physical QoL, and social QoL. PTSD participants scored over 20 points lower on all domains of functioning compared to those without PTSD. The Means of QoL domains for the total sample were consistent with those reported by Gholami et al., (2013) in a study of n=522 healthcare workers who were reported to have a moderate quality of life.

Table 5.3 below presents the results of the multivariate regressions predicting physical, psychological, social and environmental functioning and disability.

Table 5.3 Multivariate regression analyses of re-experiencing, avoidance and numbing, hyperarousal and PTSD diagnosis as predictors of quality of life outcomes in IVS sample at 12-months post-injury

	Beta	*t*	*p*	Lower	Upper
Physical QoL					
Re-experiencing	-0.121	-2.773	0.006	-3.763	-0.643
Avoidance/Numbing	-0.097	-2.159	0.031	-2.468	-0.117
Hyperarousal	-0.347	-7.771	<.0001	-6.054	-3.612
PTSD	-0.127	-3.43	0.001	-14.737	-4.007
Psychological QoL					
Re-experiencing	-0.038	-0.877	0.381	-2.047	0.783
Avoidance/Numbing	-0.242	-5.419	<.0001	-4.013	-1.878
Hyperarousal	-0.238	-5.365	<.0001	-4.147	-1.925
PTSD	-0.201	-5.497	<.0001	-18.478	-8.752
Social Relationship QoL					
Re-experiencing	0.033	0.689	0.491	-1.185	2.466
Avoidance/Numbing	-0.254	-5.159	<.0001	-4.99	-2.239
Hyperarousal	-0.161	-3.302	0.001	-3.832	-0.974
PTSD	-0.157	-3.897	<.0001	-18.736	-6.181
Environment QoL					
Re-experiencing	-0.104	-2.206	0.028	-2.734	-0.159
Avoidance/Numbing	-0.139	-2.857	0.004	-2.384	-0.442
Hyperarousal	-0.213	-4.408	<.0001	-3.281	-1.259
PTSD	-0.127	-3.199	0.001	-11.634	-2.784
Disability					
Re-experiencing	0.116	2.691	0.007	0.553	3.541
Avoidance/Numbing	0.124	2.801	0.005	0.48	2.732
Hyperarousal	0.335	7.625	<.0001	3.371	5.71
PTSD	0.145	4.006	<.0001	5.343	15.616

As reported in Table 5.3, Physical QoL was most significantly predicted by hyperarousal (R^2=.335, F(4,675)=85.071, p<.001) followed by PTSD diagnosis, re-experiencing and then avoidance and numbing. Psychological QoL was most significantly impacted by PTSD diagnosis and avoidance and numbing, although they were only marginally more significant than hyperarousal in this model (R^2=.349, F(4,674)=90.345, p<.001). Re-experiencing was not a significant predictor of Psychological QoL in this model.

PTSD most significantly impacted social relationship QoL and avoidance and numbing and hyperarousal also had significant impacts in this model (R^2=.207, F(4,675)=44.121, p<.001). However, again re-experiencing was not a significant predictor.

Environment QoL was most significantly impacted by hyperarousal (R^2=.228, F(4,674)=49.743, p<.001). PTSD diagnosis was the next most significant predictor in the model, followed by avoidance and numbing and then re-experiencing.

Disability was most significantly impacted by hyperarousal. PTSD diagnosis was the next most significant predictor in the model, (R^2=.357, F(4,675)=93.594, p<.001), followed by avoidance and numbing and re-experiencing.

In these models, hyperarousal was the most significant predictor of Physical QoL, Environment QoL, and Disability. Psychological QoL was most significantly predicted by PTSD diagnosis, although this was only marginally greater than both avoidance and numbing and hyperarousal. Avoidance and numbing was also the most significant predictor of Social Relationship QoL. Re-experiencing had little predictive association with quality of life and disability outcomes.

A second series of analyses was then performed to establish the relative impacts of each of the individual PTSD symptom clusters, and PTSD diagnosis as predictors of quality of life outcomes, while adjusting for additional predictors of quality of life and disability outcomes. Table 5.4 below shows the results of the final model adjusting for demographics and other known covariates including age, marital status, employment status, gender and average pain level in the last two weeks. P values were adjusted using the holm-bonferroni correction.

Table 5.4 Multivariate regression models of PTSD symptom criterions, PTSD diagnosis, and other known demographic chararacteristics as predictors of quality of life and disability at 12-months post-injury in the IVS sample

	Beta	*T*	Adjusted* *p*	Lower	Upper
Physical					
Re-experiencing	-0.085	-2.298	.110	-2.851	-0.223
Avoidance/Numbing	-0.085	-2.224	.110	-2.165	-0.134
Hyperarousal	-0.196	-4.976	.001	-3.763	-1.633
PTSD	-0.04	-1.277	.606	-7.576	1.607
Age	-0.094	-3.142	.012	-0.25	-0.058
Marital Status	0.094	3.299	.007	2.886	11.377
Employment	0.019	0.628	.692	-1.72	3.339
Pain	-0.527	-17.669	.001	-5.217	-4.173
Gender	0.026	0.943	.692	-1.309	3.726
Psychological					
Re-experiencing	-0.021	-0.48	1	-1.788	1.085
Avoidance/Numbing	-0.223	-4.855	.001	-3.862	-1.637
Hyperarousal	-0.167	-3.529	.001	-3.274	-0.933
PTSD	-0.151	-3.988	.001	-15.211	-5.172
Age	-0.022	-0.623	1	-0.139	0.072

Marital Status	0.059	1.717	.258	-0.584	8.701
Employment	0.087	2.395	.085	0.606	6.138
Pain	-0.253	-7.07	.001	-2.629	-1.486
Gender	-0.077	-2.354	.085	-6.054	-0.546
Social Relationship					
Re-experiencing	0.014	0.292	1	-1.59	2.147
Avoidance/Numbing	-0.216	-4.225	.001	-4.552	-1.663
Hyperarousal	-0.093	-1.773	.308	-2.883	0.147
PTSD	-0.108	-2.545	.055	-14.995	-1.933
Age	-0.123	-3.087	.012	-0.351	-0.078
Marital Status	0.026	0.684	1	-3.936	8.143
Employment	0.131	3.236	.007	2.329	9.526
Pain	-0.235	-5.891	.001	-2.969	-1.484
Gender	0.015	0.422	1	-2.813	4.35
Environmental					
Re-experiencing	-0.095	-2.016	.246	-2.609	-0.034
Avoidance/Numbing	-0.1	-2.053	.246	-2.039	-0.045
Hyperarousal	-0.117	-2.322	.147	-2.29	-0.191
PTSD	-0.057	-1.415	.474	-7.741	1.259
Age	0.001	0.034	.973	-0.093	0.096
Marital Status	0.121	3.346	.008	2.928	11.251
Employment	0.067	1.749	.324	-0.272	4.686
Pain	-0.344	-9.05	.001	-2.872	-1.848
Gender	0.025	0.715	.950	-1.57	3.366
Disability					
Re-experiencing	0.108	2.701	.042	0.511	3.233
Avoidance/Numbing	0.112	2.709	.042	0.399	2.503
Hyperarousal	0.184	4.343	.001	1.337	3.544
PTSD	0.068	1.996	.176	0.076	9.589
Age	0.065	2.02	.176	0.003	0.202

Marital Status	-0.098	-3.193	.007	-11.549	-2.897
Employment	0.007	0.207	.836	-2.344	2.897
Pain	0.439	13.635	.001	3.213	4.295
Gender	-0.03	-1.029	.608	-3.975	1.241

**Adjusted for all predictors in the model*

In the second series of multivariate models, presented in table 5.4, pain was the most significant predictor of all quality of life and disability outcomes. In relation to Physical QoL, hyperarousal was the next most significant predictor in the model, (R^2=.592, F(9,573)=92.219, p<.001) followed by marital status, with married individuals reporting significantly better physical QoL than those who were not. Age was also a significant predictor in the model, with those who were younger at the time of injury reporting worse physical QoL

Pain, alongside avoidance and numbing, hyperarousal, and then PTSD were the strongest predictors of psychological QoL (R^2=.414, F(9,572)=44.866, p<.001). Employment status and gender had marginally significant impacts on psychological QoL scores, with those employed reporting better psychological QoL than those who were not employed and women reporting worse psychological QoL than men. Age, marital status and re-experiencing were not significant predictors in this model.

Pain, followed by avoidance and numbing, employment status, age, PTSD diagnosis were all significant predictors of Social Relationship QoL (R^2=.268, F(9,573)=23.266, p<.001). Those who were younger reported poorer social relationship QoL, while being employed was significantly predictive of better self reported Social Relationship QOL. Gender, re-experiencing, hyperarousal and Marital Status did not significantly impact Social Relationship QoL.

In addition to pain, marital status had a significant impact on Environmental QoL, with those who were married reporting better Environmental QoL (R^2=.339, F(9,572)=32.581, p<.001). Re-experiencing, avoidance and numbing, hyperarousal, gender, employment status, age and PTSD diagnoses were not significant predictors in this model.

When examining Disability, pain, hyperarousal, marital status, re-experiencing and avoidance and numbing, were all significant predictors in the model (R^2=.524, F(9,573)=70.095, p<.001). Marital status was protective of self-reported disability, with those married reporting lower disability scores than those who were not. Employment, Gender, age and PTSD diagnosis did not have a significant impact on disability in this model.

To summarise, average pain in the last two weeks was the strongest predictor of each quality of life and disability outcome. When controlling for pain, of the PTSD criteria, hyperarousal was the next strongest predictor of physical and psychological QoL, and disability. Avoidance and numbing had the most significant impact on Social relationship QoL.

Other demographic factors also played important roles in the final adjusted models. Age was significantly predictive of physical and social relationship QoL. Marital status was significantly associated with better physical QoL, environmental QoL and disability scores. Employment was significantly predictive of better Social QoL and marginally predictive of better psychological QoL. Gender was marginally significant in predicting psychological QOL, with women more likely to report poorer psychological QoL than their male counterparts in this study.

5.4.1. Summary of findings

The first series of analyses was undertaken to assess the impact of re-experiencing, avoidance and numbing, hyperarousal, and overall PTSD diagnosis on the WHO quality of life and disability outcomes. Hyperarousal emerged in these models as the strongest predictor of Physical, Environmental quality of life, and Disability. Psychological quality of life was most strongly predicted by overall PTSD diagnosis.

In the second series of analysis, all predictors were modelled together in order to determine their relative importance along with other common risk factors including age, marital status, employment status, gender and average pain level in the last two weeks. In these models, average pain in the last two weeks was the strongest predictor of physical, psychological, social relationship, and environmental quality of life as well as disability. After controlling for the effects of pain, hyperarousal was only significantly predictive of physical and psychological quality of life, and disability. Avoidance and numbing was a significant predictor of social relationship quality of life outcomes.

Employment status was significantly predictive of better self-reported social relationship quality of life, suggesting that being employed was protective in this domain. Interestingly, the only gender difference that emerged in these models was on measures of psychological quality of life, whereby women reported marginally poorer psychological quality of life scores 12 months after injury than did their male counterparts in this sample.

5.5. Discussion

The aim of this study was to investigate the role of hyperarousal symptoms in predicting quality of life and disability. Previous work by Heir et al., (2010) found that hyperarousal was associated with higher levels of functional impairment compared to other symptom criteria of PTSD. This study aimed to replicate and further unpack

previous findings by utilizing an injury sample to assess the relative impact of each PTSD symptom cluster on quality of life and disability following trauma exposure. Of the PTSD criteria, hyperarousal caused the most impairment regardless of PTSD diagnostic status. Specifically, hyperarousal was associated with greater levels of impairment to physical and environmental quality of life as well as disability, and was also a significant predictor of poorer psychological and social relationship quality of life. Importantly, after accounting for all PTSD symptoms, pain was the most significant predictor of quality of life and functional impairment in this sample. This is consistent with previous literature, which has highlighted the significant impact of pain in reducing individual's quality of life on a variety of measures.

Injury survivors with PTSD at 12-months scored significantly lower on all domains of functioning compared to those without PTSD. This finding is not unexpected and is in line with previous research (Maguen et al., 2009; O'Donnell et al., 2005; Olatunji et al., 2007; Rodriguez et al., 2012; Schnurr et al., 2009). It also highlights the broad spectrum of disability imposed by a traumatic injury beyond the physical disability alone (M. O'Donnell et al., 2005). PTSD status was found to have the most significant impact on Psychological QoL, with PTSD participants scoring an average of thirty points lower than those who did not meet full diagnostic criteria (Table 5.2).

Hyperarousal was found to predict significantly worse scores on all outcomes measures apart from Psychological QoL in the first series of analyses. These findings highlight the significant role that hyperarousal symptoms play in predicting quality of life and disability following injury, regardless of PTSD diagnosis. These findings replicated those from Heir et al (2010) and further them by developing their methodology and using a more varied trauma exposed population, beyond a single disaster exposure. Notably, the current study utilised a clinician-administered diagnostic interview. This reduced the bias associated with self-report measures of

PTSD, in particular the subjective interpretation of questions, subjective bias and false reporting (F.W. Weathers, Keane, & Davidson, 2001; Williamson, 2007). The more valid assessment of PTSD symptoms in this study compared to previous work is an important strength. That the findings remained consistent with previous work despite the more stringent diagnostic tool, lends further support to the proposal that hyperarousal is a driving force behind functional impairment.

Notably, in the second series of analyses, pain emerged as the most significant predictor for quality of life outcomes. This finding is consistent with previous reports which found that pain-free individuals reported significantly better QoL, and that longer term pain was associated with reduced QoL in all domains (Skevington, 1998). Further research shows that the extent, duration, acuteness, and intensity of pain all play a significant role in determining quality of life across a wide number of domains, suggesting that a person who suffers from pain experiences many aspects of life differently than those who are pain free (Niv & Kreitler, 2001). A review by Niv and Kreitler (2001) which examined the relationship between pain and quality of life went so far as to conclude that pain is not limited to the damaged tissue, but rather affects the whole person, exerting itself across a wide range of QoL domains, and proving to be perhaps the most substantial reductive factor impacting an individual's QoL.

That pain played such a significant role in quality of life outcomes in this sample is not surprising given that the majority (65%) were involved in motor vehicle accidents that required hospilisation of a night or longer. Furthermore, as an injury sample recruited from major Australian trauma centre's, it is reasonable to assume that most of the population would be experiencing significant pain. Pain has been linked to not only the development of PTSD following trauma (Moeller-Bertram, Keltner, & Strigo, 2012; Norman, Stein, Dimsdale, & Hoyt, 2008), but also extensively to the individual symptoms of hyperarousal, particularly sleep difficulties (M. T. Smith & Haythornthwaite, 2004; M.

T. Smith, Perlis, Smith, Giles, & Carmody, 2000; Straube & Heesen, 2015), concentration problems (Berryman et al., 2013; Hart, Martelli, & Zasler, 2000; Moriarty, McGuire, & Finn, 2011), and irritability (Portenoy, Ugarte, Fuller, & Haas, 2004). As there is a significant relationship between pain and the experiencing of hyperarousal symptoms, it is unsurprising that hyperarousal was not as significant in the second model of analyses once pain was introduced as a covariate.

Despite the overwhelmingly significant role of pain in the second multivariate analyses, hyperarousal did remain significant a predictor of the domains of Physical QoL, psychological QoL, and disability. This finding supports previous research by Schell, Marshall and Jaycox (2004) who reported that individuals who scored high on the hyperarousal spectrum had poorer symptoms outcomes at 12-months. Furthermore, the finding that hyperarousal remained an equally significant predictor of physical QoL and disability, highlights the link between intrusive hyperarousal symptoms, whereby symptoms such as irritability and hypervigilance reflect a conditioned barrier between the individual and their environment.

In their study of Iraq conflict veterans, Shea and colleagues (2010) found that affective states, which are reflected by hyperarousal symptoms, have a strong impact on an individual's capacity to focus, maintain attention, complete tasks, and successfully work with other. Furthermore, Shea et al., (2010) suggested that this poorer overall functioning is linked to the individual symptoms of hyperarousal such as persistent poor sleep, difficulty concentrating, being constantly on edge, and intense feelings of anger, which in turn reduce an individuals capacity to cope with their environment due to compounding subjective distress of symptoms (M. T. Shea et al., 2010). The current study expands the knowledge of hyperarousal as not only a predictor of further symptomology but also a significant predictor of poor quality of life and disability

following trauma, highlighting the need for further research into the nature of these symptoms and their impact post-trauma (Heir et al., 2010).

The current findings suggest that hyperarousal is not only a driving force in sub-syndromal psychopathology (Marshall et al., 2006; Schell et al., 2004), but is also a significant contributor to poor quality of life outcomes and disability following trauma. Previous research suggests that the under modulation of hyperarousal symptoms, in which anterior limbic regions of the brain fail to activate effectively to appropriate stimuli, causes a significant disruption of flexible adaptation to the environment (Lanius, Brand, Vermetten, Frewen, & Spiegel, 2012; Lanius et al., 2010). This is an important consideration in clinical settings, reinforcing the need to look beyond the constraints of a clinical diagnosis when assessing an individual's need to access treatment (O'Donnell et al., 2005).

The results of this study are limited by the use of data from only twelve months after the trauma admission. Further research is needed to assess if the current findings vary at different time points post-trauma. The commitment to long-term longitudinal studies of this nature is an ongoing challenge for the field. Whilst such studies would prove more costly at both a budgeting and manpower level, they would benefit the field greatly in establishing long-term post-trauma trajectories. Previous research has shown symptom levels and the course of clinical recovery fluctuate over a period of time, thus it is entirely possible that quality of life is more adversely affected by different symptoms at different times post-trauma. Furthermore, the use of clinician administered quality of life and disability measures would overcome any artefacts of self-report measures (Williamson, 2007). Future research should aim to delineate symptoms within the PTSD clusters, particularly hyperarousal, to determine how specific symptoms have a unique influence on post trauma outcomes and functioning, rather than assigning significance

to the overall criterion. Previous research has suggested that it may be possible to delineate the hyperarousal cluster into unique groups of symptoms that reflect underlying cognitive processes, thus these symptoms may in turn have different effects on quality of life and functioning post trauma (Elhai, Biehn, et al., 2011).

Increasingly, hyperarousal has been identified as a key predictor of later disorder, functional impairment and the core of sub-clinical symptomology that drives the shift from sub-clinical states to a diagnosis of delayed onset PTSD (Marshall et al., 2006; McFarlane, 2010; Schell et al., 2004; Solomon et al., 2009). Hyperarousal symptoms are not only functionally disruptive on a physiological level but also psychologically, whereby an individual is so fatigued by persistent symptoms that the result is an impaired state of overall functioning, an important dimension required by the diagnostic criteria (Shea et al., 2010). Despite this, relatively few studies have investigated the relationship between post-trauma hyperarousal symptoms and quality of life and functioning.

This study is a further step towards identifying symptoms for intervention in individuals at risk of poor long-term outcomes post-trauma (O'Donnell et al., 2005). The findings suggests that underlying clinical constructs of hyperarousal have a wide reaching effect on psychopathology, whether directly through the impact of individual hyperarousal symptoms (such as sleep or concentration difficulties) on an individuals functional capacity or simply as a manifestation of overburdened cognitive processes whereby the experience of multiple symptoms of hyperarousal causes an individual too become too reactive to their environment to sustain a desirable quality of life. These results advocate for interventions targeting hyperarousal symptoms, to reduce stress on the individual and improve their base levels of functioning, quality of life and life satisfaction. Furthermore, the current findings bolster the growing acknowledgment in trauma literature that hyperarousal symptoms may represent the core of both post-

traumatic stress reactions and related functional impairment (Heir et al., 2010; Marshall et al., 2006; Schell et al., 2004; Solomon et al., 2009). The current findings also add further support to the notion that hyperarousal represents a unique domain of post-traumatic disability, whereby an increased cognitive burden renders an individual both cognitively and functionally impaired, and thus at an increased risk of psychopathology.

6. Surviving a traumatic injury: exploring the longitudinal interaction of hyperarousal symptoms

6.1. Commentary

The earlier chapters of this thesis illustrated the significance of previous lifetime and cumulative trauma as predictors of meeting hyperarousal criteria, as well as demonstrating that meeting hyperarousal criteria can be a significant risk factor for both the development of not only future PTSD but also other psychiatric disorder. Chapter 5 built on this by showing that hyperarousal is also a significant contributor to poorer quality of life and functioning following a traumatic injury. Together, these findings support the notion that hyperarousal is a critical predictor of post-trauma sequelae. However, missing from both this thesis and previous PTSD and trauma literature is insight into how this distinct criterion of symptoms develops following a traumatic experience.

Therefore, the final chapter in this thesis aims to delineate how hyperarousal symptoms manifest longitudinally. By analysing the predictive relationships between the symptoms of hyperarousal during longitudinal assessments, this chapter aims to identify whether one or more symptom of hyperarousal is driving the development of these criteria, or whether these symptoms develop as a series of concurrent yet more separate events in the aftermath of trauma. To achieve this, this study again utilised longitudinal data from the IVS study, which captured the presentation of symptoms in the acute aftermath of trauma, as well as at three and twelve months, and modelled each hyperarousal symptom at the earlier time point as a predictor of each symptom in the latter stages of follow up. By identifying whether there are specific driving symptoms or

groups of symptoms within the hyperarousal criterion, it may be possible to better target clinical interventions to halt the manifestation of this criteria and thus potentially stop the development of PTSD, other psychiatric disorder, and poorer quality of life and disability following trauma.

6.2. Introduction

Hyperarousal symptoms (i.e. difficulty sleeping, irritability, difficulty concentrating, increased startle response and hypervigilance), in addition to being one of the core symptom clusters of PTSD, have been reported to be a significant predictor of PTSD severity. However, little is known about how the individual symptoms of hyperarousal interact with each other and with other types of post-trauma psychopathology such as depression and other types of anxiety. Utilising a sample of 1,165 injured patients admitted to one of four level one trauma centres across Australia, this study examined the longitudinal relationship between each of the hyperarousal symptoms over a 12-month period. Using a series of path analysis, a number of significant paths emerged. Specifically, hypervigilance at the acute stage emerged as a significant predictor of hyperarousal symptoms at three months. Proportions of hyperarousal symptoms were higher at baseline and increased significantly across time in those who met diagnosis for PTSD. Further research is needed to identify the longitudinal relationship between all symptoms of PTSD, to adequately identify the driving symptoms of post-trauma psychopathology.

Hyperarousal has been described as the psychological "engine" or driving force of PTSD (Newport & Nemeroff, 2000; Nugent, Christopher, & Delahanty, 2006; Solomon et al., 2009). Extended periods of hyperarousal has been reported to negatively impact an individual's capacity to perform daily routines and achieve normal levels of rest, which in turn exacerbates stress and increases the level of cognitive disturbance (B. Litz, Gray,

Bryant, & Adler, 2002; Suvak & Barret, 2011). This diminishes biological, cognitive and emotional resources resulting in the development of additional psychopathology (Belleville et al., 2009; Newport & Nemeroff, 2000; Nugent et al., 2006; Suvak & Barret, 2011).

The identification of symptom trajectories over time is critical to understanding early predictors of later psychopathology. Intervention delivered during the early stages of symptom development may reduce allostatic burden and allow the individual to achieve a state of internal homeostasis more efficiently, and thus prevent further psychopathology (B. Litz et al., 2002; Newport & Nemeroff, 2000; Solomon et al., 2009; Suvak & Barret, 2011).

Five distinct trajectories for PTSD have been established in the literature; acute, delayed, chronic, intermittent, or residual (B. Andrews, Brewin, Stewart, Philpott, & Hejdenberg, 2009; McFarlane, 1997; Norris, Tracy, & Galea, 2009). However, it is unclear what drives these differing trajectories and why individuals who experience similar traumas experience different symptom outcomes (B. Andrews et al., 2009). What is clear is that those with an acute reaction are at an increased risk of chronic, recurrent or reactivated disorder (O'Donnell, Elliot, et al., 2007; Solomon & Mikulincer, 2006`).

Despite the known potential benefits of identifying the temporal sequence of PTSD symptoms, research in this area is limited (Schell et al., 2004). Increasingly, there has been a call for a paradigm shift from considering PTSD as a monolithic disorder to one comprising more dynamic symptomology that can vary in course and stability over time (Solomon et al., 2009). Establishing the dynamic interplay between and within symptom clusters would strengthen support for this paradigm movement. Clinically, given the predictive relationship between hyperarousal and the development of later psychopathology, there is a great potential for early identification of hyperarousal

symptoms to be used as a screen for later PTSD. In particular, these symptoms may represent an early indicator of chronicity of PTSD as well as other types of psychopathology. As such Hyperarousal symptoms may have a therapeutic application and could be targeted as a form of pre-emptive intervention (B. Litz et al., 2002; Nugent et al., 2006; Schell et al., 2004; Solomon et al., 2009).

In a longitudinal study of community violence victims, Schell, Marshall and Jaycox (2004) investigated the relationship between each PTSD symptom clusters over three time points. They concluded that all three symptom clusters (re-experiencing, avoidance, and hyperarousal) decreased in severity over time. Most significantly, the hyperarousal cluster was found to strongly influence the maintenance of other symptom clusters longitudinally (Schell et al., 2004). Specifically, in individuals with the most pronounced hyperarousal symptoms at baseline showed the least overall improvement in PTSD symptomology over time (Schell et al., 2004).

Schell et al.'s, (2004) findings were later replicated in a follow up study of individuals hospitalized for a mandible fracture. Results demonstrated that hyperarousal was a significant predictor of future re-experiencing, avoidance and further hyperarousal (Marshall et al., 2006). Interestingly, neither re-experiencing nor avoidance was significantly related to the other clusters over the 6 and 12-month follow-up assessments (Marshall et al., 2006). In contrast Solomon et al, 2009, a study of Israeli War Veterans, reported a correlation between all three symptom clusters at all time points over a 20-year follow up. In this study, hyperarousal also predicted future avoidance and intrusion symptoms (Solomon et al., 2009).

The current study extends this early work by examining the inter-relationship between the various hyperarousal symptoms over a 12-month period in a large Australian injury sample. The relative contribution of each symptom of hyperarousal to

later symptoms of hyperarousal will be analysed. The primary aim of this study is to ascertain which hyperarousal symptom, if any, is the strongest driver of PTSD within an injury setting, and to examine how hyperarousal symptoms develop over time.

6.3. Method

6.3.1. Participants

Data was collected as part of a large-scale study into the 12-month longitudinal course of psychopathology following a traumatic injury. Participants were originally recruited following admission to one of four level-one trauma services located in the major hospitals of Victoria, New south Wales and South Australia. Individuals were included to this study if they 1) experienced a physical injury that required an admission of at least 24hrs to the trauma service 2) experienced either no brain injury or only a mild traumatic brain injury (as defined by the American Congress of Rehabilitation medicine (1993) 3) were between 18 and 70 years of age at admission and 4) had a reasonable comprehension of English. Participants were excluded if the injury was a result of self-harm, if they were currently abusing intravenous substances, or if they had a current psychiatric disorder at admission.

Of the 1,165 participants in the sample who completed the acute assessment 73.4% were males (N=855) and 26.3% were female (N=306) with a mean age of 39 years at time of initial recruitment (SD=12.39). The mean stay in hospital was 12 days (SD=12.9 days), with the majority of cases admitted due to motor vehicle accidents (65.9%, N= 758). Other sources of injury included: fall (16.1%, N=185), assault (6.3% N=73), workplace incidents (5%, N=58) and Other (6.7%, N=77).

Nine hundred and eighty five participants were successfully measured at three months, with the sample remaining very similar in percentage of males (N=729, 74%)

females (N=256, 26%) and mechanism of injury (motor vehicle accident=65.6%, fall=16.5, assault=6%, workplace incident=5.3% and other=6.5%).

Eight hundred and sixty eight participants were then measured again successfully at 12 months post injury, with the demographics again remaining almost identical to the previous time points in percentage of males (n=635, 73.2%), females (n=233, 26.8) and mechanism of injury (motor vehicle accident=66.1%, fall=15.9%, assault=6.2%, workplace incidents=5.1% and other=6.7%).

6.3.2. Measures

At each assessment (acute, 3-months, and 12-months post-injury), current PTSD was assessed and anchored to the hospitalisation injury using the Clinician Administered PTSD Scale-IV (CAPS), a structured clinical interview that uses a four-point scale to assess the frequency and intensity of each PTSD symptom (Blake et al., 1995). The CAPS was scored using a '1-2' system, whereby the presence of a symptom was indicated by at least a frequency score of 1 and an intensity of 2 (thus it was causing at least moderate distress) (Blake et al., 1995). A PTSD diagnosis was reached if an individual reported the occurrence of a traumatic stressor, in conjunction with at least one re-experiencing, three avoidance/numbing, and two arousal symptoms of at least one-month's duration, which in turn caused impairment or significant distress, in accordance with the DSM-IV criteria (American Psychiatric Association, 2000; Blake et al., 1995). Along with sound test-retest reliability (0.90), the CAPS possesses good sensitivity (0.84) and specificity (0.95) (Blake et al., 1995). Interviews were performed in person (in the acute hospital setting) and over the telephone for the 3 and 12-month follow-ups by research officers trained in the administration of the CAPS.

Hyperarousal was assessed using 5 questions within the CAPS (each relating to one DSM-IV symptom), with frequency and of intensity asked for each symptom. For

example, the frequency of sleep problems was assessed with the question "Have you had any problems falling or staying asleep? How often in the past month (week)? When did you first start having problems sleeping? Participant's responses were graded on a four-point scale ranging from 0 (never) to 4 (daily or almost every day). For each symptom endorsed, participants were asked about the intensity of the symptom. For sleep, this question was "how much of a problem did you have with your sleep? How long did it take you to fall asleep, how often did you wake up at night, how many total hours did you sleep each night? Responses were graded by the interviewer as ranging from 0 (no sleep problems) to 4 (extreme, very long latency, or profound difficulty staying asleep).

6.3.3. Procedure

All participants provided informed, written consent at each of the following assessments. Acute interviews were undertaken prior to discharge, on average 7.2days (±9.6) post injury. Hospital records were used to obtain information related to demographics, hospital admission and injury-related factors. At three and twelve months post-injury, participants were re-contacted via telephone and reminded of their previous participation, and upon re-consenting to a further follow-up were re-administered the CAPS via telephone interview to assess the prevalence of PTSD symptomology related to their hospitalisation injury. All interviews were recorded to ensure inter-rater reliability (five percent were rescored blind to original scoring) and adherence to study protocol. Overall, the diagnostic consistency between interviewers on the CAPS was 0.98 at Acute, 1.00 at 3 months, 0.98 at 12 months and 0.97 at 24 months.

6.3.4. Data Analysis

The aims of this study are twofold: (1) to ascertain which hyperarousal symptom, if any, was the strongest longitudinal driver of the hyperarousal cluster within an injury

setting; and (2) more broadly, to examine how hyperarousal symptoms develop over time. The initial analysis reports the proportion of each hyperarousal symptom endorsed at the acute, 3-month and 12-month follow-up assessments.

Structural Equation Models (SEM) using Amos Software version 14 were used to explore how hyperarousal symptoms related to each other over time. For ease of in interpretation, a separate model was developed for each hyperarousal symptom outcome, at each time point. Models contained paths from each of the five-hyperarousal symptoms at the previous assessment to the outcome symptom in the next stage of follow-up. The models were run using Amos, before non-significant paths were trimmed from each model and re-run to assess the adequacy of the model fit data. Missing data was estimated using the maximum likelihood function of AMOS, whereby the likelihood for each estimate is computed separately for those cases with complete data on some variables and those with complete data on all variables and are then maximized together to find the estimates (Hox, 1999). Like multiple imputation, this method gives unbiased parameter estimates and standard errors (Hox, 1999).

In order to assess each the strength/effectiveness of each model, the chi-square was first noted, with values closer to zero indicating little difference between the expected and observed covariance matrices. Further, the probability levels had to be greater than p=0.05. The comparative fit index (CFI) was used to assess the model fit, using the parameters suggested in Hu and Bentler (1999), which state that a value of .95 or higher is desirable. Finally, the Root Mean Square Error of Approximation (RMSEA) was utilised as a final measure of model evaluation. An acceptable model fit was indicated by an RMSEA value of 0.06 or less (Hu & Bentler, 1999). In following this pattern for each model, it was possible to establish which symptoms at a particular assessment were significantly predictive of symptoms at the subsequent assessment,

providing insight into which symptoms of hyperarousal drive the development of further symptoms over time.

6.4. Results

6.4.1. Demographics

The proportion of injury survivors that met each hyperarousal symptom, at the acute, 3 month and 12-month follow-up assessment are provided in Table 6.1 and Figure 6.1 below.

Table 6.1 Proportion of the IVS sample endorsing each hyperarousal symptom at the acute, 3 and 12-month follow-up assessments (N=1,156)

	Not met (%)	Met (%)
Acute		
Sleep	46.8	53.2
Irritability	81.3	18.7
Concentration	80	20
Hypervigilance	93.8	6.2
Startle	91.9	8.1
3-month		
Sleep	59.3	40.7
Irritability	72.3	27.7
Concentration	76.6	23.4
Hypervigilance	81.4	18.6
Startle	88.5	11.5
12-month		
Sleep	64	36
Irritability	77.4	22.6
Concentration	79.9	20.1
Hypervigilance	78.4	21.6
Startle	85.2	14.8

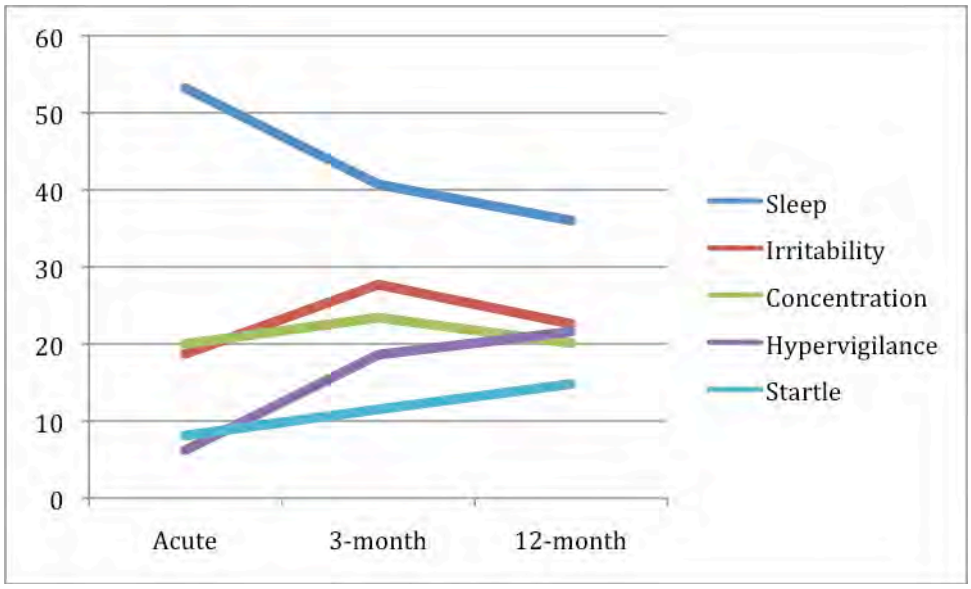


Figure 6.1 Change in the proportion of the IVS sample that met each of the hyperarousal symptoms over time

In the acute phase, sleep difficulties were the most commonly met symptom, reported by 53% of the sample. This was followed by concentration problems (20%) and irritability (18%). Increased startle response and hypervigilance, were the least endorsed symptoms experienced by only 8.1% and 6.2% of the sample respectively.

At three months, sleep was again the most reported symptom of hyperarousal, presenting in 40.7% of the sample. This was followed by irritability (27.7%), concentration (23.4%), hypervigilance (18.6%) and finally increased startle response (11.5%).

In the final phase of assessment, 12-months, sleep difficulties were still the most reported symptom, presenting in 36% of the sample. Irritability presented in 22.6%, followed by hypervigilance (21.6%), concentration (20.1%) and finally by increased startle response (14.8%).

Overall sleep problems were the most highly reported symptom at each assessment, declining more rapidly between the acute and three month assessment compared to the three and twelve month assessment. In comparison, both startle

response and hypervigilance showed an increase in symptoms across all three assessments, with hypervigilance increasing from 6.2% at acute to 21.6% at 12 months and startle response growing in proportion from 8.1% at the acute phase to 14.8% at the 12 month assessment. Interestingly, both irritability and concentration problems showed a slight increase between the acute and three month assessment followed by a slight decrease between the 3 and 12month assessment. Overall these symptoms were relatively consistent over time.

6.4.2. Acute hyperarousal symptoms predicting hyperarousal symptoms at three months

As previously outlined in the data analysis section of this report, in order to examine the relationships between symptoms recorded at each phase of assessment with symptoms at the next phase, a series of models were developed whereby each symptom at the earlier phase were modelled as predictors of symptoms at the next assessment. Non-significant paths were trimmed from each model, leaving only significant relationships in the models provided. Figure 6.2 below shows the significant results of model 1 where the acute symptoms of hyperarousal were modelled as predictors of sleep difficulties at three months.

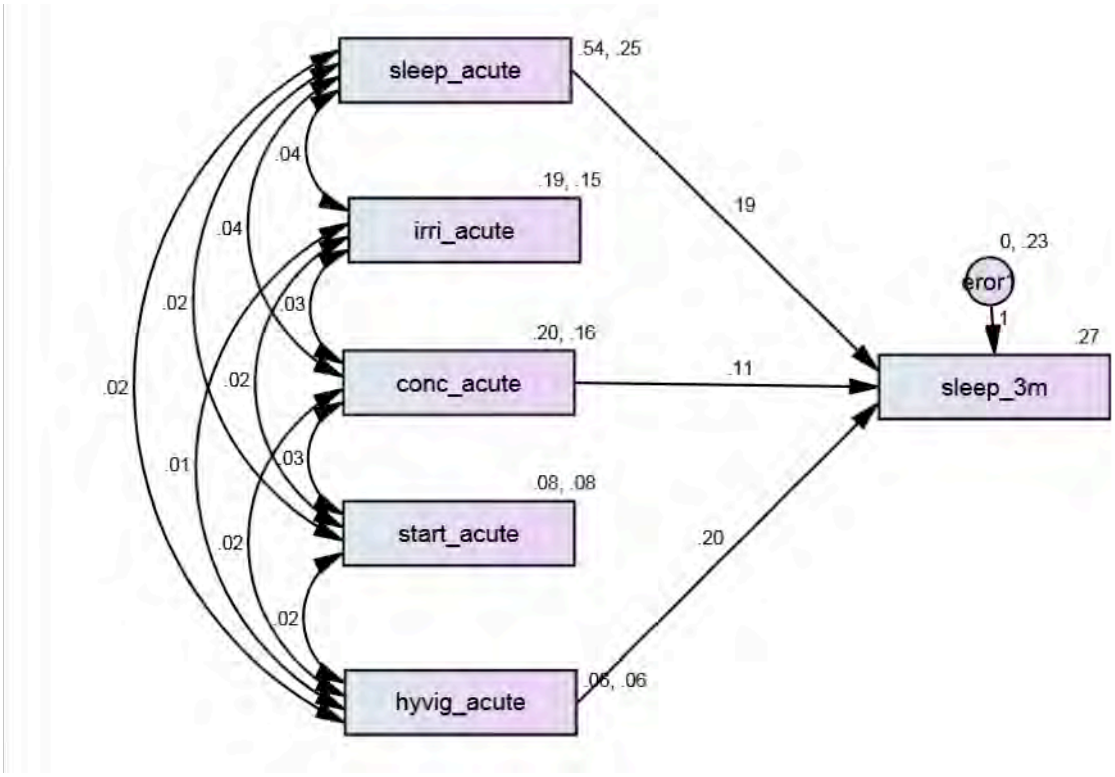


Figure 6.2 Model 1: Acute hyperarousal symptoms predicting sleep difficulties at 3-months

In this model, as expected acute sleep difficulties (B=.19) predicted sleep difficulties at three months. Interestingly hypervigilance (B=.20) had an equally strong association with 3 month sleep problems. Finally concentration problems (B=.11) also emerged as a

smaller but significant predictor of sleep difficulties. This model showed good fit, with Chi-square = 2.841, p=.242, CFI of .998, and RMSEA = .019.

Figure 6.3 shows the results of model 2 where the acute symptoms of hyperarousal were modelled as predictors of irritability problems at the three-month follow-up.

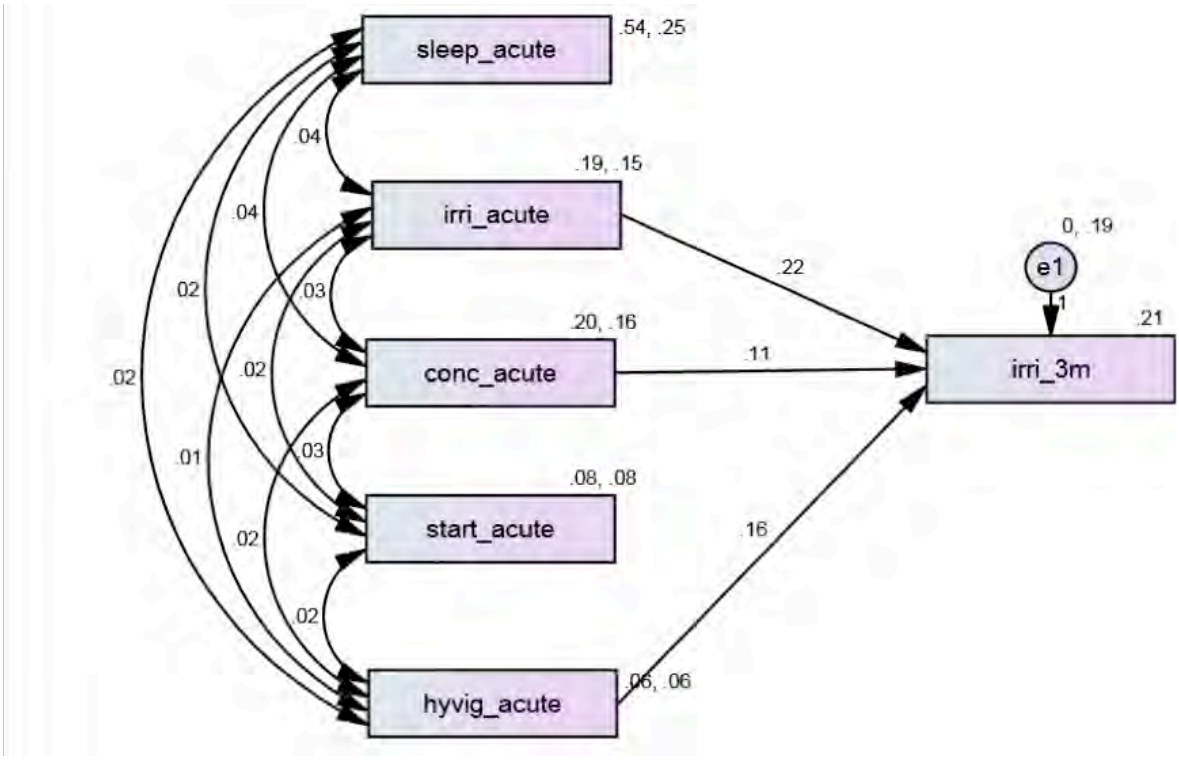


Figure 6.3 Model 2: Acute hyperarousal symtpoms predicting irritability at 3-months

Acute irritability was the most significant predictor of 3 month irritability (B=.22). hypervigilance (B=.16) was the next most significant predictor in the model, while acute concentration (B=.11) and was also a significant predictor. The model showed goodness of fit, with Chi-square= 5.040, p=.08, CFI =.992 and RMSEA =.036.

Figure 6.4 below shows the results of model 3 where the acute symptoms of hyperarousal were modelled as predictors of concentration problems at the three-month follow-up.

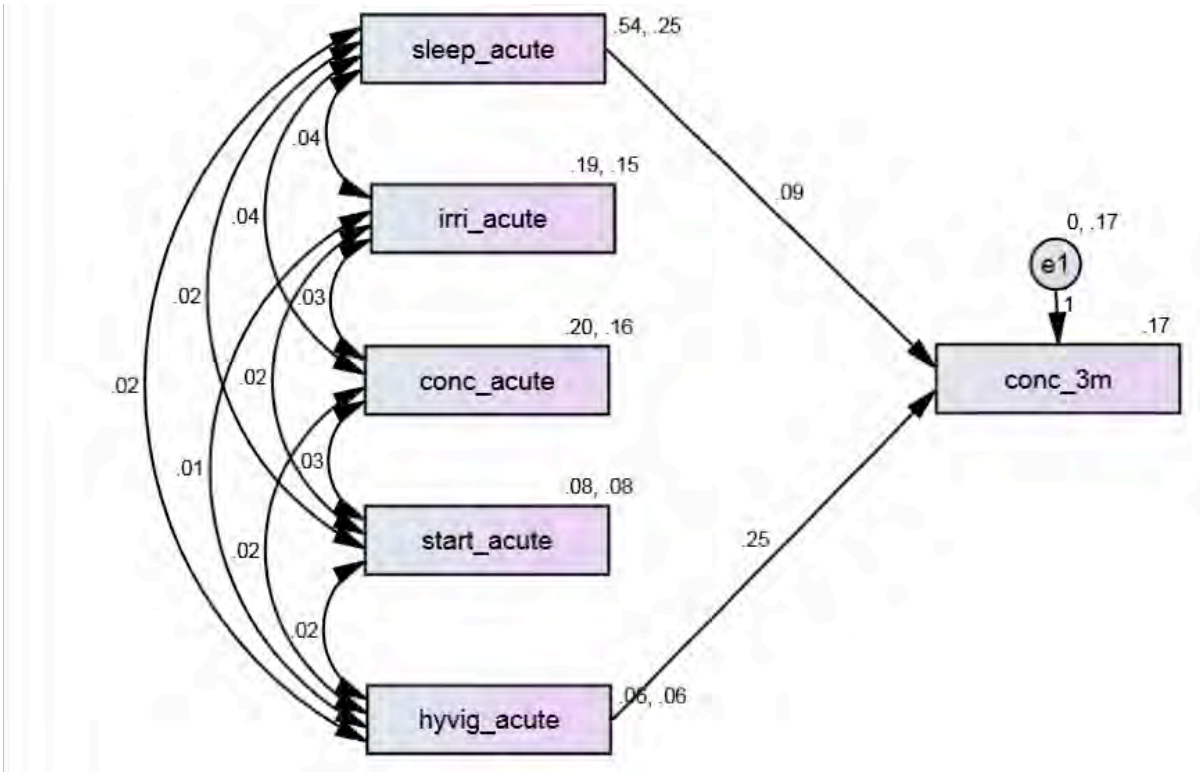


Figure 6.4 Model 3: Acute hyperarousal symptoms predicting concentration problems at 3-months

Unlike the previous two models, where a symptom in the acute phase predicted that same symptom 3 months later, concentration problems at 3 months was not predicted by concentration problems in the acute phase. Acute hypervigilance (B=.25) and acute sleep difficulties (B=.09) were the only significant predictors of concentration problems at 3 months. This model showed poor goodness of fit, with Chi-square= 55.638, p=.000, CFI =.873 and RMSEA =.124.

Figure 6.5 below shows the results of model 4 where the acute symptoms of hyperarousal were modelled as predictors of hypervigilance at 3 months.

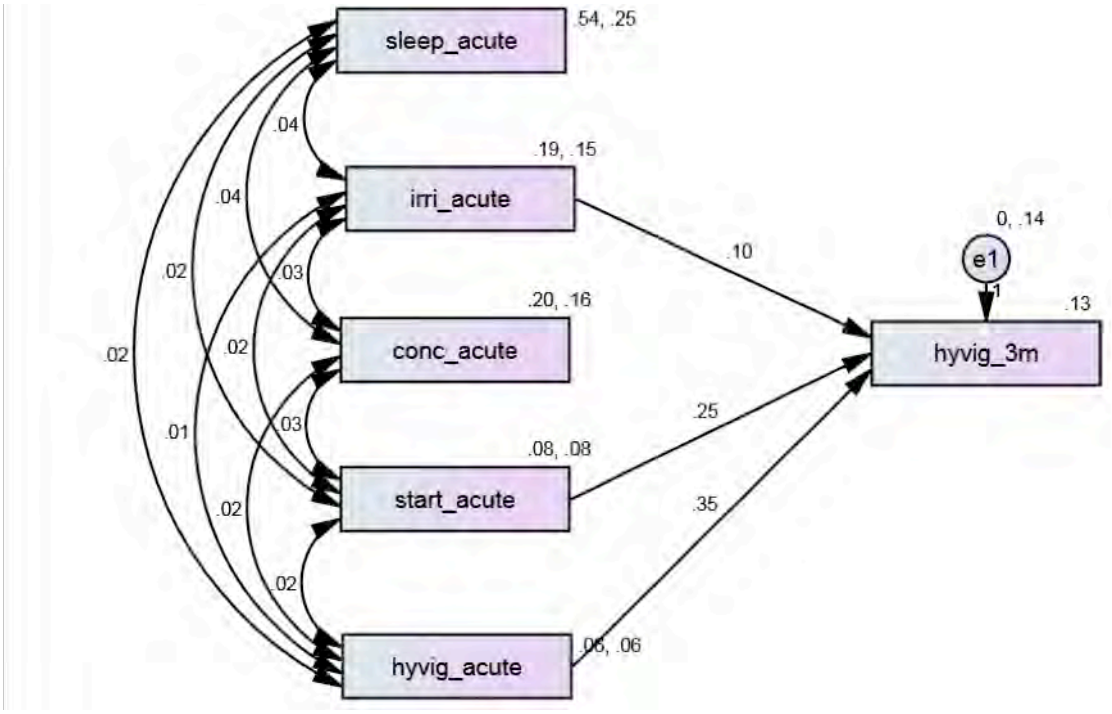


Figure 6.5 Model 4: Acute hyperarousal symptoms predicting hypervigilance at 3-months

This model, like the first two models of acute to 3-month symptoms, showed that having hypervigilance at the acute phase was the most significant predictor of hypervigilance at three months (B=.35). Acute startle (B=.25) and acute irritability (B=.10) were also significant predictors of 3-month hypervigilance. This model showed good fit, with Chi Square =1.724, p=.422, CFI=1, and RMSEA =.045.

Figure 6.6 below shows the outcome of the path analysis where the acute symptoms of hyperarousal were modelled as predictors of increased startle response at three months.

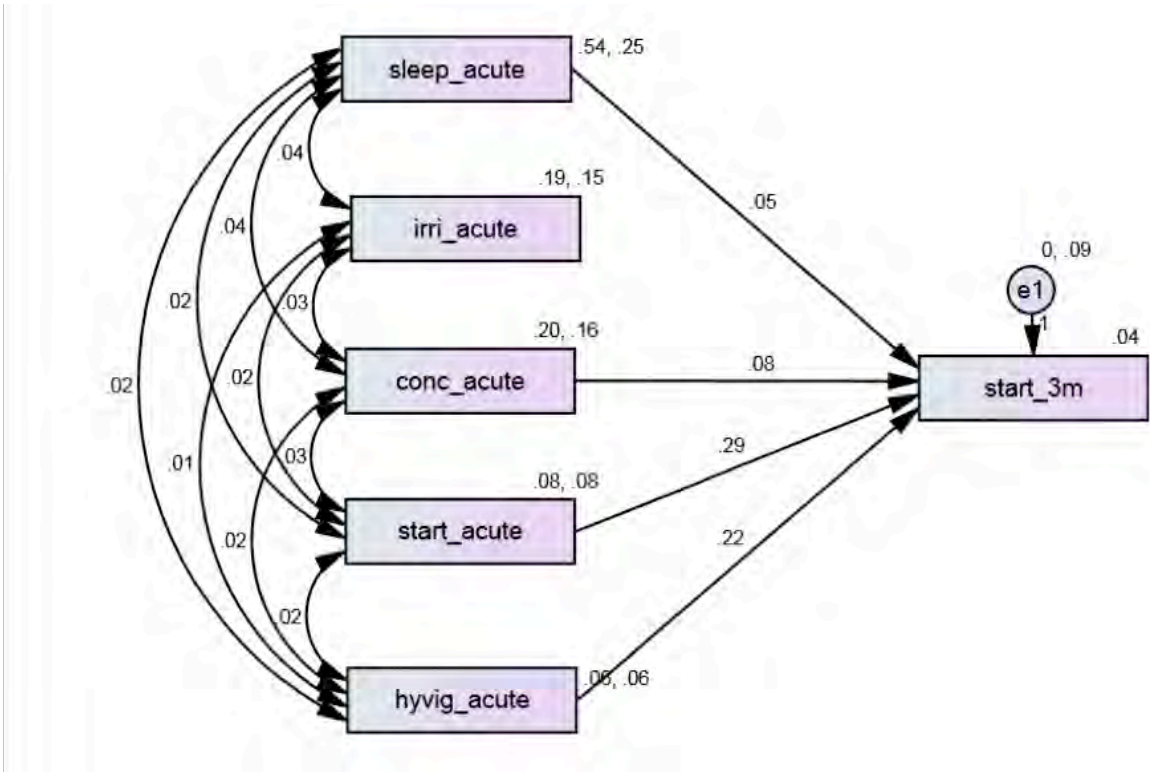


Figure 6.6 Model 5: Acute hyperarousal symptoms predicting startle response at 3-months

As with all previous models, except concentration, having the symptom at the acute phase significantly predicted having that symptom again at the 3-month follow up. In this case acute startle response was the most significant predictor of startle response at three months (B=.29). Hypervigilance emerged again as a significant predictor (B=.22), along with acute concentration difficulties (.08) and acute sleep difficulties (B=.05). This model, in combination with the previous model, highlights the significant relationship that exists between hypervigilance and startle response in the acute to three-month period. The model showed goodness of fit, with chi square= .844, p=.358, CFI=1, RMSEA = .000.

Summary of findings from phase 1: Acute -> three-month follow –up

Looking at the overall pattern of acute predictors of three-month hyperarousal symptoms, four important findings emerged. Firstly, each acute symptom of hyperarousal was significantly predictive of itself at three months post-injury, and for all but sleep and concentration difficulties, was the most significant predictor of itself. This

is not surprising and represents the role that previous psychopathology plays in predicting itself again at future assessment (Kessler et al., 2005; Lewinsohn et al., 1994; Pine et al., 1998). Concentration difficulties, however, was not significantly predictive of itself, suggesting this symptom may be secondary to the other symptoms of the hyperarousal cluster.

The symptom, which was the most consistent predictor across all hyperarousal symptoms at three months, was hypervigilance. As can be see in Figures 6.2-6.6, acute hypervigilance was a significant predictor of all five hyperarousal symptoms at 3 months, the strongest relationship being between acute hypervigilance and hypervigilance at 3 months followed by three-month sleep difficulties, irritability, concentration problems and increased startle response.

The acute symptom, which predicted the least number of hyperarousal symptoms at 3 months, was irritability, which was only predictive of itself and hypervigilance problems at 3 months.

6.4.3. Acute hyperarousal symptoms predicting hyperarousal symptoms at twelve months

The next series of analyses examined the association between acute hyperarousal symptoms and each of the hyperarousal symptoms at 12 months post-injury.

Figure 6.7 below models the acute symptoms of hyperarousal as predictors of 12 month sleep difficulties.

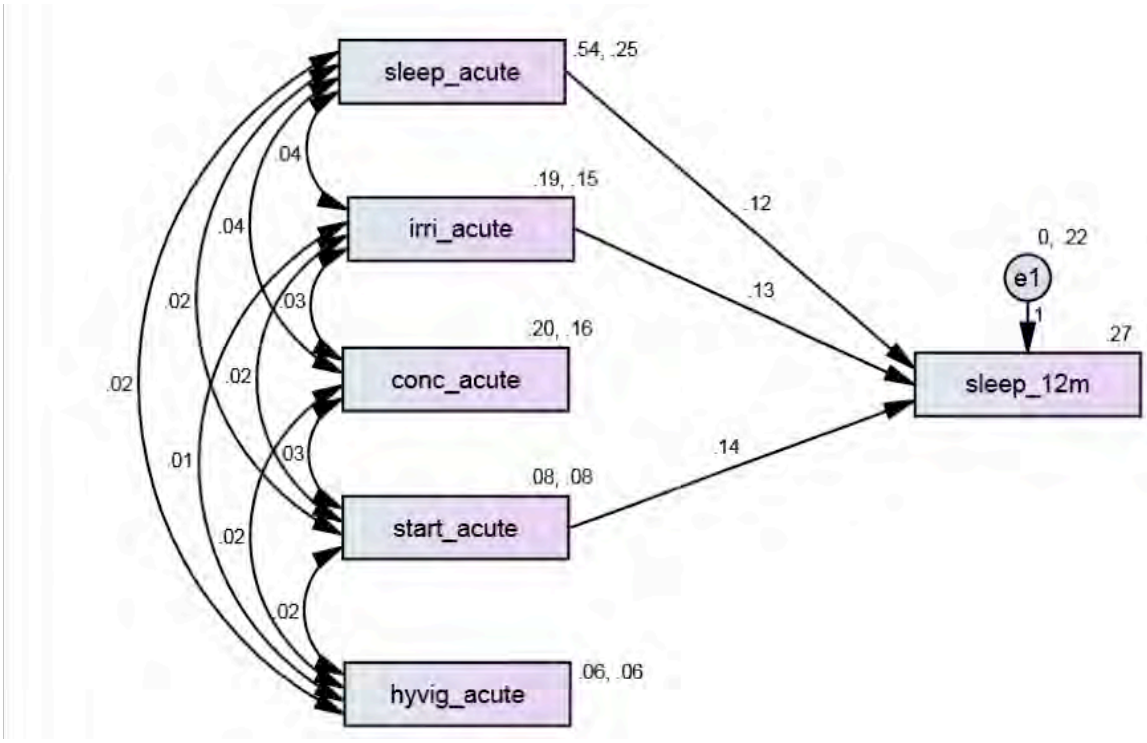


Figure 6.7 Model 6: Acute hyperarousal symptoms predicting sleep difficulties at 12-months

Acute startle response was the strongest predictor of 12 month sleep difficulty (B=.14), followed closely by acute irritability (B=.13) and acute sleep difficulties (B=.12). This was not observed in the earlier model examining predictors of three-month sleep difficulties. In fact the only consistent predictor across the phase 1 and Phase 2 model for sleep was sleep in the acute phase. The model showed goodness of fit, with chi square = 6.248, p=.044, CFI=.989, RMSEA=.043.

Figure 6.8 below shows the model of acute symptoms of hyperarousal predicting 12-month irritability problems.

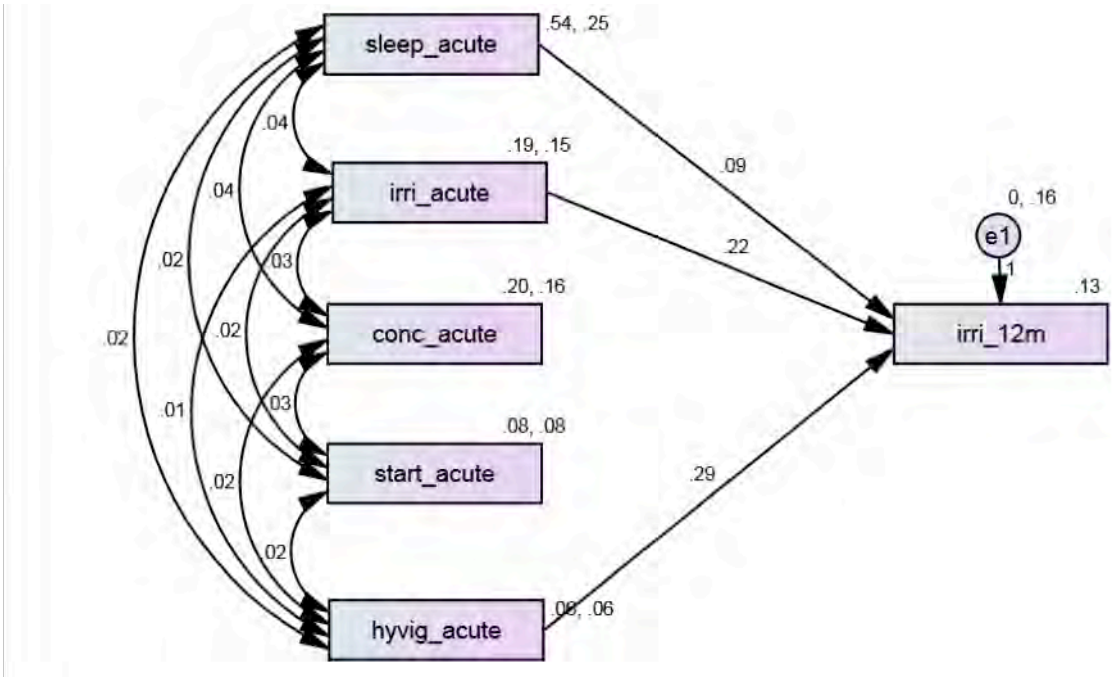


Figure 6.8 Model 7: Acute hyperarousal symptoms predicting irritability at 12-months

Irritability problems at 12 months were most strongly predicted by acute hypervigilance (B=.29), acute irritability (B=.22) and acute sleep difficulties (B=.09). The pattern observed was similar to the acute predictors of 3-month irritability, with the only difference in the models being that acute sleep predicted irritability at 12-months, but not 3-months and acute concentration problems predicted 3-month irritability but not 12-month irritability. This model had good fit, Chi square= 3.340, p=.188, CFI=.997, RMSEA=.024.

Figure 6.9 below shows the model of acute hyperarousal symptoms predicting 12 month concentration difficulties.

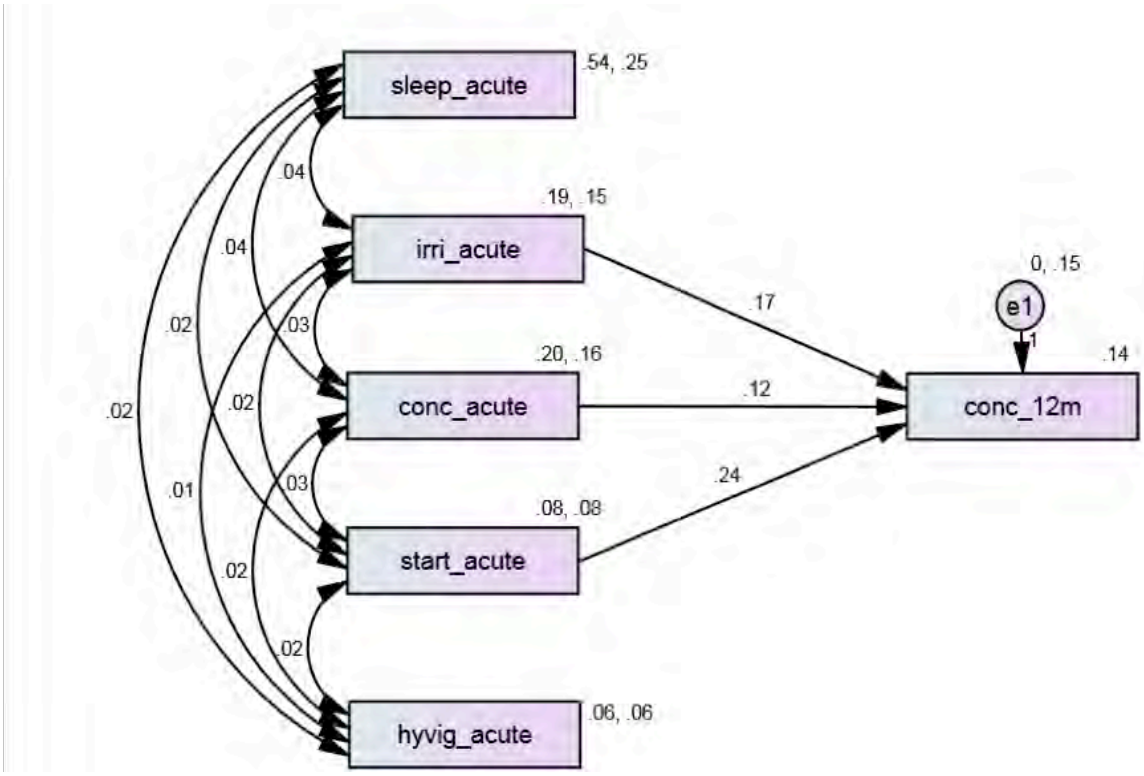


Figure 6.9 Model 8: Acute hyperarousal symptoms predicting concentration problems at 12-months

This model differed significantly from what was observed between the acute predictors and 3-month concentration. Acute concentration difficulties predicted concentration at 12 months (B=.12), whereas it did not predict itself at 3 months. Further, acute hypervigilance and sleep difficulties also predicted 3-month concentration problems, whereas it was acute startle (B=.24), and irritability (B=.17) that predicted concentration difficulties at 12 months. This model had good fit, Chi square=2.911, p=.233, CFI = .998, RMSEA = .020.

Figure 6.10 below shows the significant paths of the model between the acute symptoms of hyperarousal and hypervigilance at 12 months.

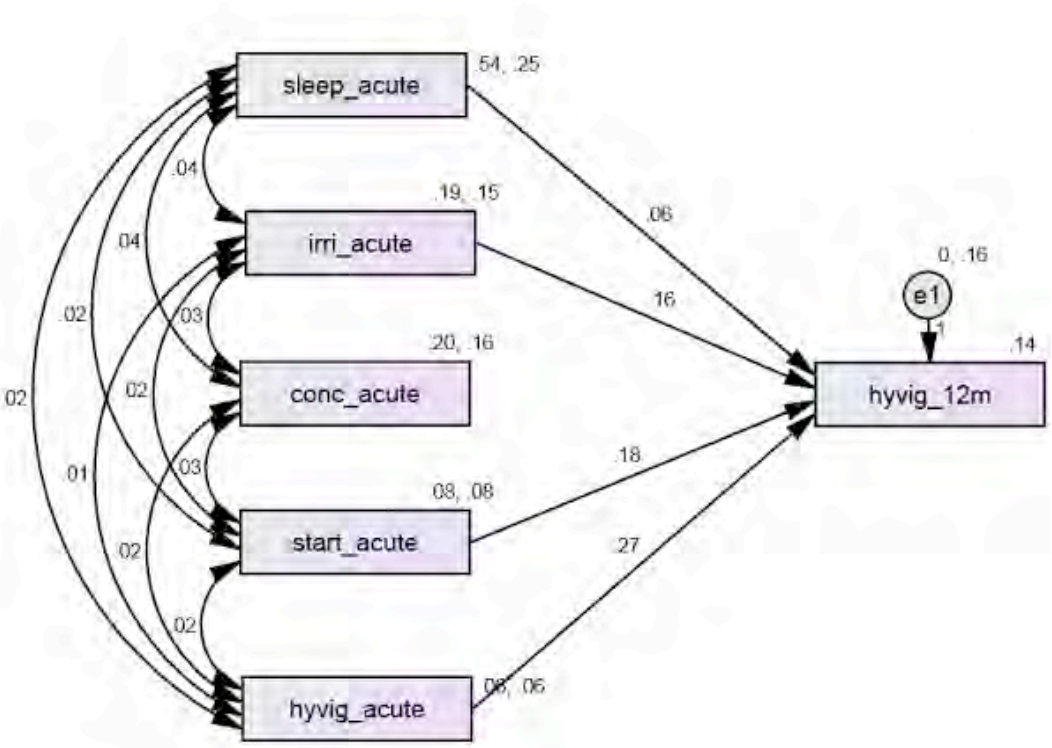


Figure 6.10 Model 9: Acute hyperarousal predicting hypervigilance at 12-months

Similar to that reported at acute to three months, acute hypervigilance was the strongest predictor of 12 month hypervigilance (B=.27). Further, acute startle (B=.18) and acute irritability (B=.16) were significant predictors of 12 month hypervigilance. Acute sleep, although significant, was once again the weakest predictor of 12 month hypervigilance (B=.06). This model showed good fit, with Chi Square =.011, p=., CFI=1, and RMSEA =.000

Finally Figure 6.11 below shows the significant paths of the model between the acute symptoms of hyperarousal and increased startle response at 12 months.

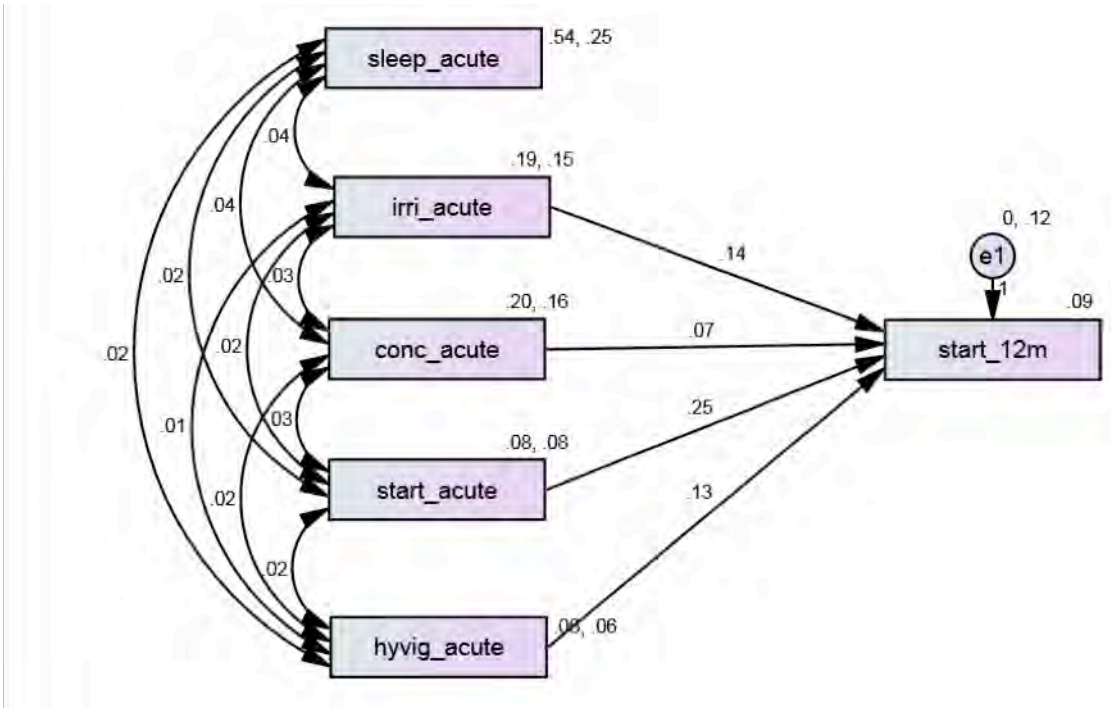


Figure 6.11 Model 10: Acute hyperarousal symptoms predicting startle response at 12-months

The strongest predictor of 12 month startle was acute startle response (B=.25). This is not surprising and extends the earlier reported relationship acute and 3-month startle. In contrast, acute irritability emerged as a significant predictor of startle response in the current model (at 12 months, B=.14) but not in the prediction of 3 month startle. Acute hypervigilance (B=.13) and concentration problems (B=.07) were significant predictors of both 3 month and 12 month. Overall, this model was significant and had good fit, Chi square = 1.162, p=.281, CFI=1, RMSEA = .012.

Summary of findings: Acute -> twelve-month follow –up

In the previous 5 models where the predictive role of acute symptoms of 12 month hyperarousal were examined, acute irritability was the only symptom to predict all other symptoms of hyperarousal at 12 months. This was in direct contrast to the acute to 3-month models whereby acute irritability predicted the least number of hyperarousal symptoms at 3 months. This suggests that irritability may have a longer

tail of effect and may play a greater role in the development of delayed symptoms rather than symptoms experienced in the first 3 months post-injury.

While acute hypervigilance predicted all 3-month symptoms, the ability of this symptom to predict 12-month symptoms of hyperarousal was limited to hypervigilance, irritability, and increased startle response. The strongest relationship was between acute hypervigilance and irritability (0.29) followed by 12-month hypervigilance (0.27) and then startle. These findings suggest that hypervigilance may play a more significant role in the short term rather than long term prediction of symptoms.

Finally, the acute symptom, which predicted the least number of hyperarousal symptoms at 12 months, was concentration difficulties, which were only significantly predictive of increased startle response at twelve months.

6.4.4. Three-month symptoms of hyperarousal predicting hyperarousal symptoms at twelve-months

The final series of analyses reported below examined the association between three-month hyperarousal symptoms and the presence of individual hyperarousal symptoms at 12-months post-injury.

Figure 6.12 below shows the significant paths between 3-month symptoms of hyperarousal and 12-month sleep difficulties.

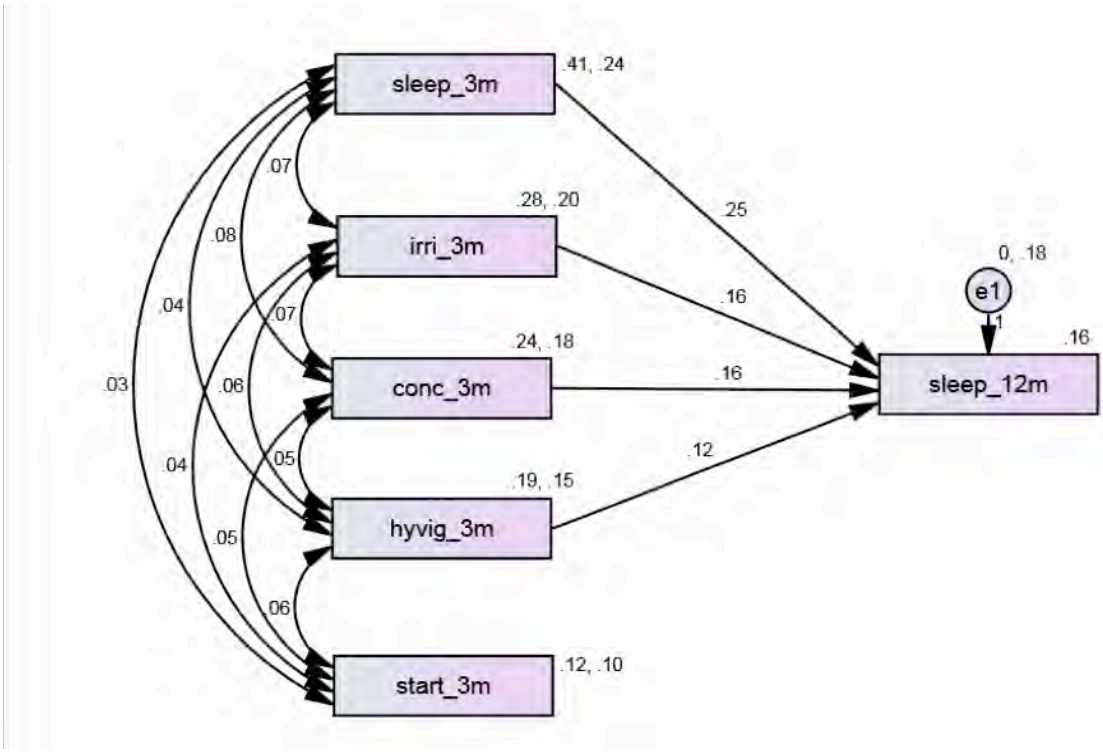


Figure 6.12 Model 11: 3-month hyperarousal symptoms predicting sleep difficulties at 12-months

Consistent with the previous models of sleep, three-month sleep difficulties were the strongest predictor of 12 month sleep difficulties (B=.25), supporting a consistent pattern of prediction in relation to this symptom whereby early sleep difficulties in general predict later sleep problems. In line with the previous model (acute to 12-months) irritability at three months was also a significant predictor of 12-month sleep problems. Three month hypervigilance (B=.12) and Concentration problems (B=.16) emerged as significant predictors of 12 month sleep problems which together with the findings of the previous models for sleep suggests that both hypervigilance and concentration may have a short tail of effect, with their predictive ability limited to the previous time point only. This model was significant, Chi Square = .019, p=.890, CFI = 1, RMSEA = .000.

Figure 6.13 below shows the significant relationships between 3-month symptoms of hyperarousal and 12 month irritability.

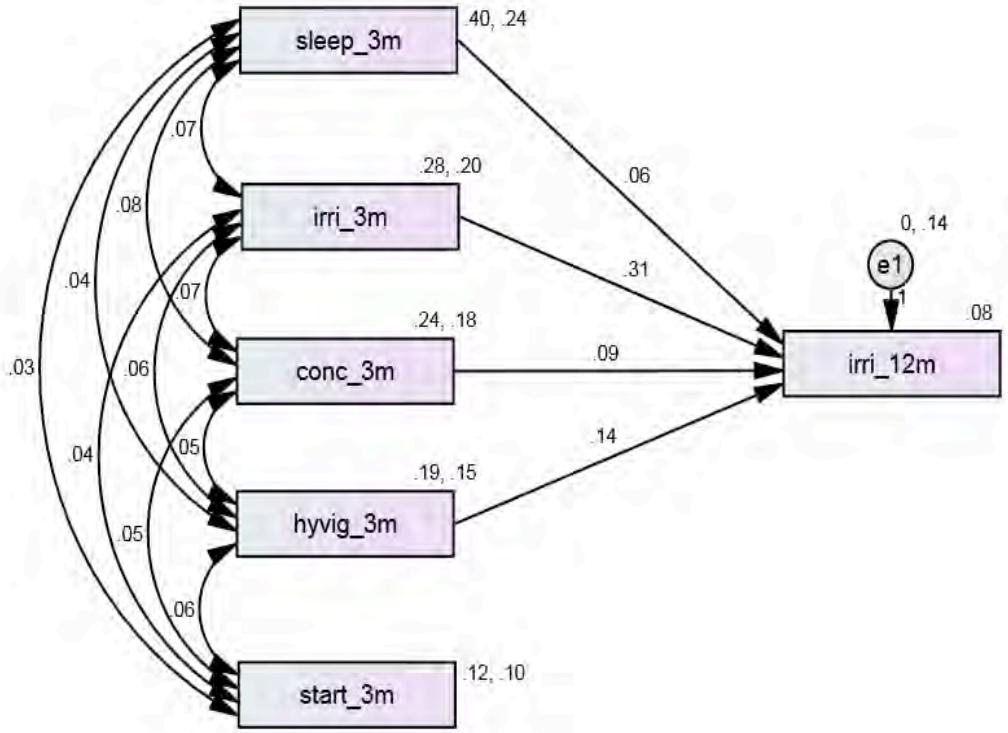


Figure 6.13 Model 12: 3-month hyperarousal symptoms predicting irritability at 12-months

Consistent with the acute to 3 and the acute to 12 month models, irritability at 12 months was predicted by 3-month irritability (B=.31), in addition to hypervigilance (B=.14), Concentration (B=.09) and Sleep (B=.06). This model showed that all the significant paths found in phase 1 and phase 2 were significant for phase 3, suggesting that these relationships may exist throughout the data, but are more observable in the longer follow up of three to twelve months. This model had good fit, Chi square=1.274, p=.259, CFI=1, RMSEA =.015.

Figure 6.14 below shows the significant relationship between the 3-month symptoms of hyperarousal and concentration problems at 12-months.

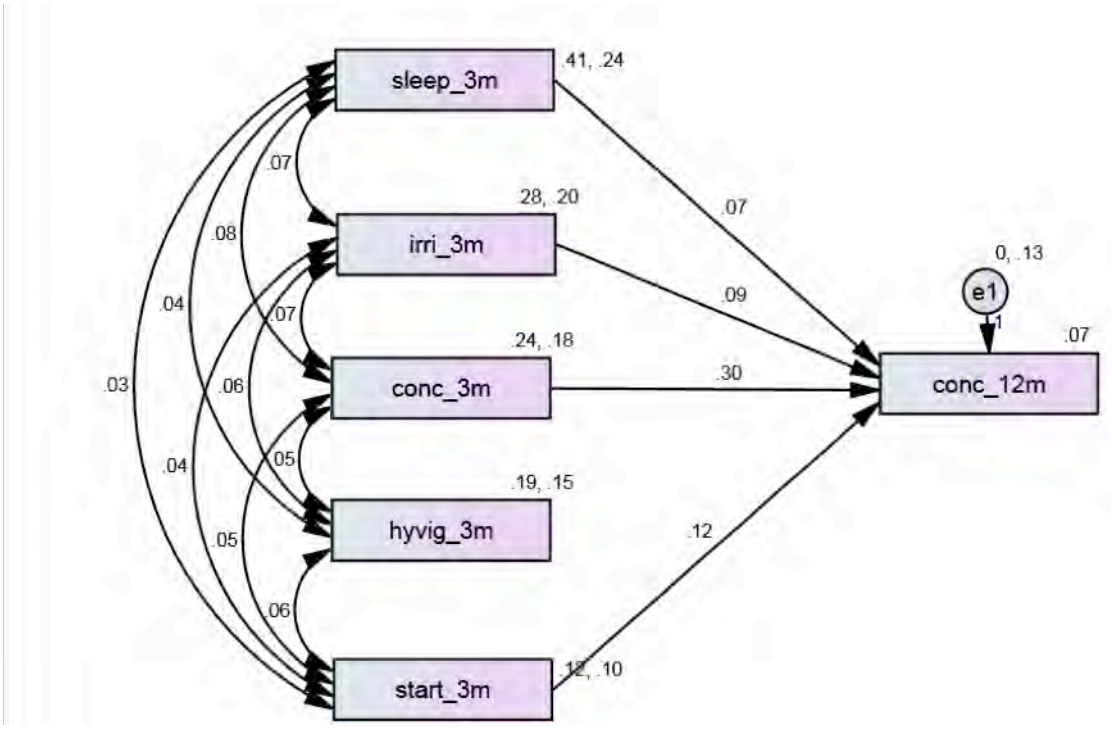


Figure 6.14 Model 13: 3-month hyperarousal symptoms predicting concentration problems at 12-months

This model was similar to the acute to 12 month model whereby concentration problems at 3 months predicted concentration problems at 12-months (B=.30), and startle response (B=.12) and irritability (B=.09) were again significant predictors of concentration problems. This model was significant, Chi square = 2.312, p=.128, CFI=.999, RMSEA= .034.

Figure 6.15 shows the significant relationships between the 3-month symptoms of hyperarousal and 12 month hypervigilance.

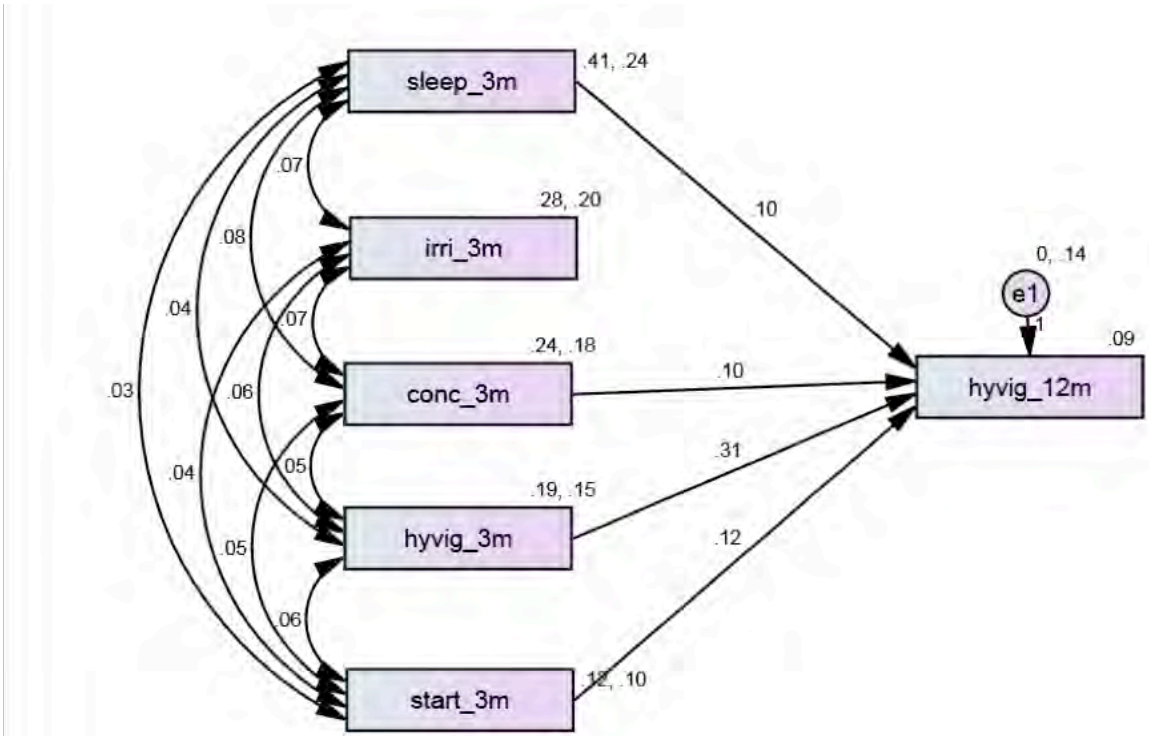


Figure 6.15 Model 14: 3-month hyperarousal symptoms predicting hypervigilance at 12-months

Hypervigilance at 12 months was most strongly predicted by 3-month hypervigilance (B=.31), followed by 3-month startle response (B=.12), and then concentration (B=.10) and sleep difficulties (B=.10). Startle response and irritability were also consistently reported in each phase as predictors of hypervigilance. This model is the first where concentration problems emerged as a significant predictor of future hypervigilance. This model was significant and displayed good fit, Chi square = 2.747, p=.097, CFI=.998, RMSEA = .039.

Figure 6.16 below shows the significant paths in the model of 3-month hyperarousal symptoms predicting 12-month increased startle response.

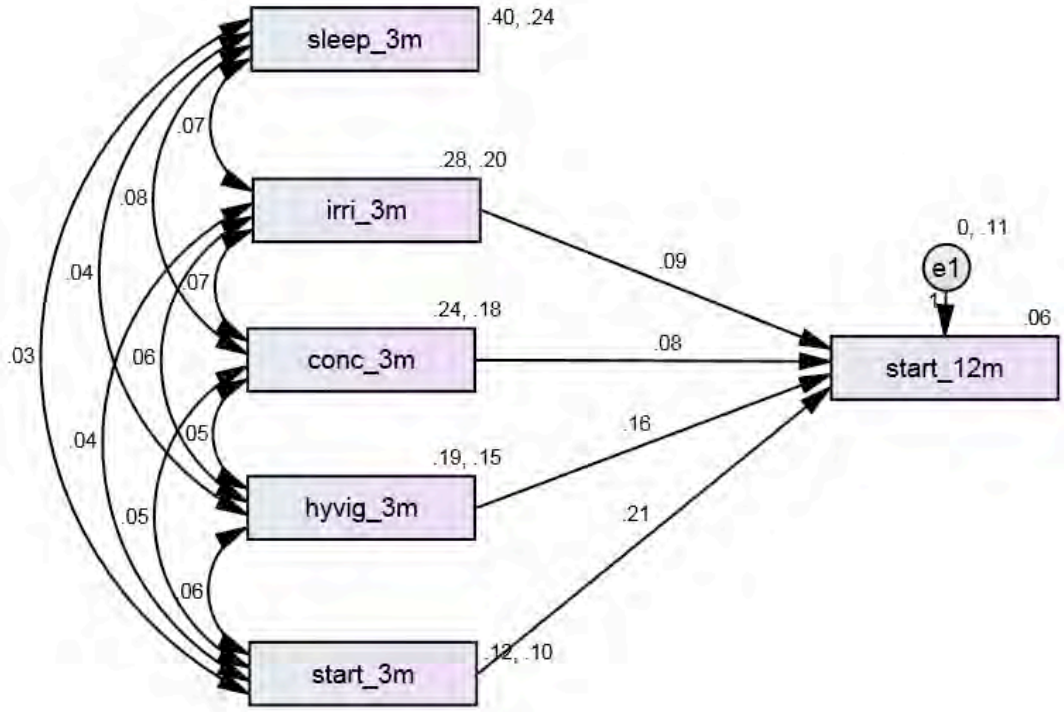


Figure 6.16 Model 15: 3-month hyperarousal symptoms predicting startle response at 12-months

In this model, 3-month startle was the strongest predictor of 12-month startle response, which was a consistent pattern of prediction across all models. Other predictor included 3-month irritability (B=.09), 3-month hypervigilance (B=.16) and 3-month concentration problems (B=.08). The model was significant and had good fit, Chi Square = 1.191, p=.275, CFI=1, RMSEA=.013.

Summary of findings for phase 3: Three months -> twelve-month follow –up

Similar to the pattern that was partially observed in Phase one and Phase two, each symptom measured at three-months was significantly predictive of itself at the twelve-month follow-up.

In this phase, one symptom did not emerge as the most consistent predictor across all hyperarousal symptoms at twelve months. Instead, there was a more widespread pattern of prediction between different symptoms at three months and symptom outcomes at twelve months. Sleep difficulties at three-months were significantly predictive of twelve month irritability, concentration problems, and

hypervigilance. Three-month irritability was significantly predictive of sleep difficulties at twelve months, as well as concentration difficulties and increased startle at twelve months. Three-month hypervigilance was significantly predictive of twelve-month sleep difficulties, irritability, and increased startle response. This suggests that once symptoms are acquired at three months, an individual is at greater risk for acquiring a variety of symptoms through this range of predictive relationships that exist between most of the hyperarousal symptoms at three months and the symptoms at twelve months.

The 3-month symptom with the least predictive power was startle response, which was only significantly predictive of concentration problems at twelve months.

Figure 6.17 below shows the most significant paths (B≥.2) between the symptoms of hyperarousal from acute to three months, and three months to twelve months.

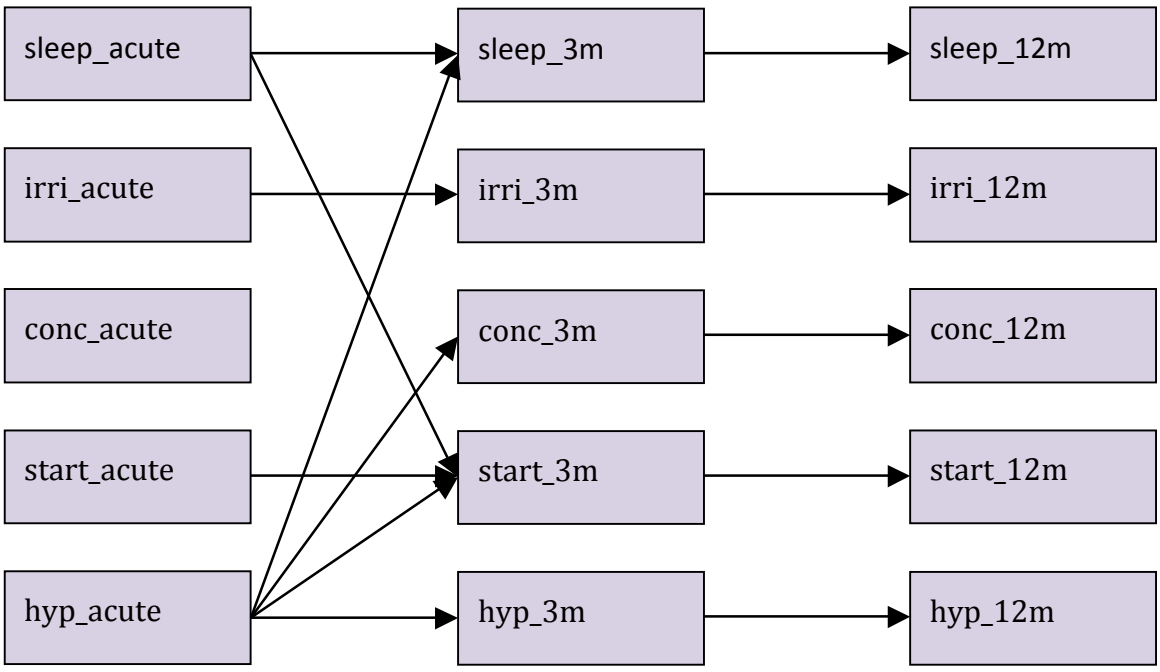


Figure 6.17 Full model of most significant paths between symptoms of hyperarousal from acute to 3-months, and 3-months to 12-months in the IVS sample (B≥.2)

In the full model of symptom prediction (B≥.2) across the twelve-month period, symptoms of hyperarousal are strongly predictors of themselves longitudinally. In the acute to three-month period however, hypervigilance plays a significant role in predicting all symptoms of hyperarousal, suggesting it is a critical factor in the development and maintenance in symptoms of hyperarousal in the earlier post trauma phase.

6.4.5. Proportion of symptoms met in those with and without PTSD over twelve months.

The previous models highlight the role that each hyperarousal symptom plays in the recruitment of new hyperarousal symptoms over time. However, the results of the analysis are limited by the fact that only a proportion of this sample goes on to meet full PTSD criteria, and it is not clear if their symptom trajectories are different. It is plausible that symptoms of hyperarousal present differently in those who do and do not go on to meet PTSD criteria.

Thus, to further assess the incidence of hyperarousal symptoms over time, the sample was divided into those who did not meet PTSD at either 3 or 12 months (No PTSD), those who did not meet criteria for PTSD at 3 months but met criteria at 12 months (new onset PTSD), and those meeting criteria at both 3 and 12 months (consistent PTSD). The proportions of symptoms present in each group are reported in tables 6.2 and 6.3.

PTSD rates, in the entire sample increased steadily over time, from 3.6% (N=25) in the acute setting to 11.4% (N=80) at the 12-month follow up. There was also a steady increase in the number of participants who met criterion D over time, from 25.2% in the acute phase (N=176) to 34.6% at 12 months (N=242).

In order to examine whether there was an observable difference in the proportion of hyperarousal symptoms reported by those who met criteria of PTSD and those who did not, Table 6.2 below shows the proportion of the sample who met each symptom at the acute and three month follow ups; in those who did not meet PTSD criteria at 3 months, met PTSD at three months (new onset) and who met criteria both at the acute stage and at three months (stable). For the purposes of this examination the 1 month duration criteria for PTSD was not operationalized. This allowed the sample to be divided into those who would have met criteria for PTSD at acute and at three months, and thus be considered stable PTSD over 3 months (Group 3).

Table 6.2. Proportion of IVS participants meeting criteria for each of the hyperarousal symptoms by 3 month group: no PTSD in the 3 month follow-up period, new onset PTSD at 3 months; stable PTSD diagnosis from acute months to three months.

	Acute	*3-months*
Group 1: No PTSD 3m		
Sleep	51.2	36.1
Irritability	16.6	22.3
Concentration	18.2	17.5
Hypervigilance	5	13.5
Startle	6	7
Group 2: New onset 3m		
Sleep	67.6	89.7
Irritability	35.3	77.9
Concentration	32.4	82.4
Hypervigilance	45.8	67.6
Startle	26.5	48.5
Group 3: Stable 3m		
Sleep	100	75
Irritability	62.5	87.5
Concentration	66.7	75
Hypervigilance	6.2	70.8
Startle	8.1	75

6.4.5.1. Group 1: No PTSD within 3 month follow-up period

Among participants who did not meet criteria for PTSD in the acute setting, there was an overall decrease in sleep problems from 51.2% in the acute setting to 36.1% at 3 months. The proportion of participants who reported irritability increased (16.6% to 22.3%), as did hypervigilance (5% to 13.5%) and Startle response (6%-7%). Concentration difficulties remained largely consistent 18.3% to 17.5%.

6.4.5.2. Group 2: New onset PTSD at three months

Among participants meeting criteria for PTSD at 3 months but not in the acute setting there was a 22.1% increase in sleep difficulties. The proportion of those reporting irritability problems also increased by 42.6%, as did concentration by 50%, Hypervigilance by 21.8% and startle response by 22%.

6.4.5.3. Group 3: PTSD in the acute phase and at 3 months.

In those who met criteria for PTSD at both the acute assessment and the three-month follow-up assessment (stable), the proportion of individual symptoms increased for all symptoms at three months, except sleep difficulties, which dropped from 100% to 75%. Irritability increased from 62.5% to 87.5%, concentration difficulties increased from 66.7% to 75% of the sample, hypervigilance from 6.2% of the sample to 70.8% and startle response from 8.1% to 75%.

The most notable difference displayed in table 6.2 is the higher proportion of hyperarousal symptoms in both the new onset PTSD group and the stable PTSD group when compared to the proportions of symptoms in those who did not meet criteria for PTSD. The proportions of symptoms in the new onset group and stable group started high at the acute phase and increased over the three month follow-up, whereas in the group who did not meet PTSD, symptoms presented in only a minor proportion of the group (apart from sleep at 50%) and showed little variation over three months.

Table 6.3 below expands on the results of Table 6.2 to include the entire longitudinal sample over 12 months. This table shows the proportion of the sample that met each hyperarousal symptom in the following 3 groups: (1) participants with no PTSD at the acute, three and twelve month follow-ups, (2) participants who met PTSD criteria for the first time at twelve months (new onset) and (3) participants who met criteria at three months and at twelve months (stable).

Table 6.3. Proportion of IVS participants meeting criteria for each of the hyperarousal symptoms by 12 month group: no PTSD in the 12 month follow-up period, new onset PTSD at twelve months; stable PTSD diagnosis from three months to twelve months.

	Acute	*3-months*	*12-months*
Group 4: No PTSD 12m			
Sleep	51.6	37.3	31
Irritability	16.3	24.2	16.3
Concentration	18.8	20.2	14
Hypervigilance	5.4	15.4	16
Startle	7.2	9.2	9.6
Group 5: PTSD at 12m only			
Sleep	73.5	67.6	85.3
Irritability	44.1	50	79.4
Concentration	23.5	26.5	82.4
Hypervigilance	8.8	23.5	73.5
Startle	5.9	8.8	52.9
Group 6: PTSD at 3m and 12m			
Sleep	77.3	90.9	86.4
Irritability	56.8	84.1	90.9
Concentration	47.7	86.4	79.5
Hypervigilance	25	81.8	81.8
Startle	31.8	61.4	77.3

6.4.5.4. Group 4: No PTSD over 12-months

Similar to the results reported in Table 6.2, In those who did not meet criteria for PTSD over the twelve months of follow-up, sleep was the most reported symptom in this sample at the acute phase, before decreasing over the next two follow ups to 31%. In contrast, the proportion of people who reported hypervigilance increased in this sample over all three time-points, increasing by 11% over the twelve-month period. The overall pattern differed from the results presented in Table 6.2 however, in that the proportions

of most hyperarousal symptoms increased slightly from acute to three months, before remaining roughly consistent or slightly decreasing by the twelve-month follow-up. This pattern closely resembles the pattern observed for the entire sample in Figure 6.1, and indicates the large crossover in these cohorts i.e. the low prevalence of PTSD in the entire sample.

Group 5: New onset PTSD at 12-months

This sample in Table 6.3 represented those who reported new onset PTSD at twelve months, but did not meet criteria for PTSD at either the acute or 3month assessment. In this sample, a greater proportion of people reported every symptom at the acute stage follow-up, except for startle response, which was lower (5.9%) than those who did not meet PTSD criteria at any time-point (7.2%). At three months, hypervigilance was reported by an additional 17% of this sample, despite the other symptoms remaining relatively stable from acute to three months. At twelve months, however, all symptoms showed a significant increase in the proportions of this group, with the proportion of participants reporting sleep difficulties increasing by 17.7%, irritability by 29.4%, concentration difficulties by 55.9%, hypervigilance by 50%, and startle response by 44.1%. Similar to the results of table 6.2, symptom proportions increased significantly at the time of PTSD diagnosis, in this table at 12 months (table 6.2: diagnosis at three months).

6.4.5.5. Group 6: PTSD at 3 and 12 months

This sample comprised those who met diagnostic criteria for PTSD at both the three-month and twelve-month assessments. In this group, which according to the diagnostic criteria of PTSD needed two or more symptoms to meet criteria, participants naturally had much higher proportions of symptoms at the acute phase. This persisted at three and twelve months compared to the other groups. The proportion of

participants reporting symptoms in this group appear to peak at three months and remain the same to twelve months, with increased startle response showing the only significant proportional change from three to twelve months, increasing by 17%. This was a similar pattern to that which was observed in Table 6.2, where the stable group reported a much higher proportion of symptoms at the acute phase and these proportions remained higher at following assessments compared to the new onset and no PTSD groups.

6.5. Discussion

This study of injury-trauma survivors is the first longitudinal study to model how the unique symptoms of hyperarousal predict one another over time and to examine the longitudinal presentation of individual symptoms of hyperarousal in those with and without PTSD. The first analysis showed the proportion of each symptom met at each time of assessment (acute, 3, and 12-months). The second series of analyses modelled each symptom at the previous assessment as a possible predictor of each symptom at the later assessment, to determine how meeting symptoms of hyperarousal at different time points following trauma impacted the development of later hyperarousal symptomology. Finally, the proportion of symptoms met at each time point was analysed in those who met PTSD at different stages of the longitudinal study, to assess how symptom presentation differed in those who did and did not meet diagnostic criteria for PTSD.

The results found that whilst sleep difficulties was the most commonly reported symptom of hyperarousal at the acute, 3-month and 12-month time of assessment (table 6.1), it had the least impact in the path analysis models as a predictor of other symptoms of hyperarousal. These results suggest that rather than being a driving force in hyperarousal, sleep difficulties may be better recognised as a marker of an

overburdened allostatic load reflective of an individual's internal dysregulation (Belleville et al., 2009; Lamarche & De Koninck, 2007). Further, it is plausible that sleep is more interrelated (both as a predictor or indicator) with other criterions of PTSD, such as intrusive recollection, or avoidance (Belleville et al., 2009; Lamarche & De Koninck, 2007; Ohayon & Shapiro, 2000), which were not examined in this study.

Irritability was the second most reported symptom at each assessment (Table 6.1), with the proportion of people reporting irritability greatest at 3 months before declining, at 12 months. The path analysis models that utilised acute symptoms of hyperarousal as predictors of 12-month symptoms, found that acute irritability had the most significant impact on 12-month hyperarousal symptoms presentation. Acute irritability was significantly predictive of twelve-month sleep difficulties, concentration difficulties, startle response and hypervigilance. However, acute irritability predicted the least number of hyperarousal symptoms at 3 months. These findings propose that irritability has a greater effect on symptom outcomes long term, playing a more significant role in the delayed onset of symptoms rather than in the shorter three-month timeframe. Rather than impacting the immediate uptake of further symptoms of hyperarousal, it appears that irritability in the presence of other symptoms deteriorates faculties of coping and thus sensitises the individual to distressful thinking, increasing their propensity to be sensitised long term and manifest future symptoms (Solomon et al., 2009) .

In contrast, one of the least reported symptoms in the acute phase, hypervigilance, was found to be the most significant predictor of three-month symptoms of hyperarousal. As can be seen in Figures 6.2-6.6, acute hypervigilance was a significant predictor of all five hyperarousal symptoms at three months. The strongest relationship was between acute hypervigilance and hypervigilance at 3 months, followed by three-

month sleep difficulties, irritability, concentration problems and increased startle response. In the acute to twelve-month analysis, acute hypervigilance was only significantly predictive of twelve-month irritability and increased startle response. The combined results of these analyses suggest that hypervigilance plays a more significant role in the short-term prediction of symptoms following trauma, rather than predicting symptoms over a delayed period of time (12 months).

The low proportion of startle response in the acute phase and increase in proportion over the next two assessments (table 6.1) supports early work by Shalev et al., (2000) which showed that these symptoms typically developed no earlier than 1-6 months following trauma. This is a fundamentally important observation as it may show that neurobiological transformations require a period of time to manifest, during which progressive neuronal sensitization occurs (Shalev et al., 2000). Difficulty concentrating appeared to behave in a similar manner to startle, which may be indicative of the same process of sensitization (McFarlane, 2010; O'Donnell, Elliot, et al., 2007). Alternatively, the initial observed lack of startle may be associated with the hospital setting in which this assessment was conducted, where the potential for exposure to situations that typically elicit startle response is not present.

From three months to twelve months, one symptom did not emerge as the most consistent predictor of hyperarousal symptoms at twelve months. Instead, there was a more widespread pattern of prediction between different symptoms at three months and symptom outcomes at twelve months. This suggests that once symptoms are acquired at three months, an individual is at greater risk for acquiring a variety of symptoms through this range of predictive relationships that exist between most of the hyperarousal symptoms at three months and the symptoms at twelve months. The only

symptom, with limited predictive ability at 3 months was startle response, which only predicted concentration problems at twelve months.

Almost every hyperarousal symptoms predicted itself at the next follow-up (one exception being concentration difficulties at acute to three months). This finding is not surprising, as previous literature has established that previous psychopathology is a significant predictor of future episodes of the same disorder, it makes sense that this finding is extrapolated to individual symptoms predicting themselves at later follow-ups in longitudinal samples (Kessler et al., 2005; Lewinsohn et al., 1994; Pine et al., 1998).

The proportion of acute hyperarousal symptoms was significantly higher in those who went on to reach diagnostic criteria for PTSD than in those who did not (Table 6.2 and 6.3). This supports earlier work that showed those who develop PTSD have higher baseline rates of symptomology during the acute phase (O'Donnell, Elliot, et al., 2007). Thus it is clear that individual's exhibiting hyperarousal symptoms in the acute phase of recovery may be at an increased risk of chronic, recurrent or reactivated disorder (Tables 6.2 and 6.3) (Koren, Arnon, & Klein, 1999; O'Donnell, Elliot, et al., 2007; Solomon & Mikulincer, 2006`).

The most important finding of this study is the identification of acute hypervigilance as a strong predictor of all other hyperarousal symptoms at three months (Figure 6.2-6.7). Acute hypervigilance was found to be a significant predictor of startle response, concentration difficulties, irritability problems, and sleep difficulties at the 3-month follow-up. The large effect of hypervigilance on symptoms from Acute to 3-months may reflect two possibilities: that hypervigilance is driving internal destabilization into further symptomology or alternatively, it is simply the first sign of the internal dysregulation that occurs post-trauma at three to twelve months. Further research is required to establish which is more probable.

Previous research suggests that hypervigilance manifests as a result of automatic processing biases, whereby an individual actively scans their environment for threatening stimuli, with identification of such stimuli activating trauma networks and producing symptoms such as intrusive recollections, flash back and nightmares (Buckley et al., 2000). Our findings show that hypervigilance in the acute stages following trauma activates further symptoms of hyperarousal, and suggest that clinical intervention targeting hyper vigilant responders may prevent the onset of further PTSD psychopathology. This study is novel in its assessment of hyperarousal symptom development, with the unique finding that hypervigilance is central to the development of further hyperarousal symptomology (which in itself has been established to be at the core of PTSD symptomology) a unique first step towards using symptom based research to expand knowledge of the aetiology of PTSD symptoms and thus inform and improve clinical practice (Fleeson, Furr, & Arnold, 2010; Schmidt, 2015).

There are several limitations that must be acknowledged with this research. Firstly, as this is the first published study to examine the temporal sequence of hyperarousal, it is possible that the results are not truly reflective of the general nature of hyperarousal after exposure to traumatic events and may be limited to injury survivors. Secondly, but relating to the first limitation, is that most participants experienced motor vehicle accidents as their study-entry trauma. Thus, results may only be reflective of symptoms suffered after an MVA and perhaps different to other trauma types such as combat, interpersonal violence or childhood trauma.

The results of this study suggest that hypervigilance in the early stages of recovery is critical to the development the hyperarousal cluster over time. From three months, however, there is a dynamic interplay of symptom causality that fluctuates between symptoms. This finding lends support to the paradigm of a dynamic expression

of PTSD whereby symptomology is constantly changing and interplaying within an individual (Solomon et al., 2009). Given the conclusions of Schell et al., (2004), Marshall et al., (2006) and Solomon et al., (Solomon et al., 2009) into the driving nature of hyperarousal criterion against the symptom clusters of re-experiencing and avoidance, further research is needed to explore which of the hyperarousal symptoms have key predictive relationships with other symptom manifestations within Post-Traumatic Stress Disorder and other psychopathology. The minimum outcome achieved by this analysis is a substantial building block for future research into what has been identified as the driving cluster of PTSD, and a move towards symptom based research in PTSD that has been advocated for within the psychiatric community (Fleeson et al., 2010; Marshall et al., 2006; Pietrzak et al., 2013; Schell et al., 2004; Schmidt, 2015; Solomon et al., 2009).

7. Conclusion

The aim of this thesis was to determine the role of the hyperarousal symptoms of PTSD as the phenomenological drivers of post-trauma sequelae. Utilising three longitudinal, epidemiological data sets, this thesis explored the following questions:

1. What factors predict the development of the hyperarousal symptoms?
2. Are hyperarousal symptoms a predictor of disorders other than PTSD?
3. How do hyperarousal symptoms impact quality of life and disability following trauma?
4. How do hyperarousal symptoms manifest longitudinally?

Whilst there has been substantial research into the development of hyperarousal symptoms following trauma, much of this research has been limited to single symptom outcomes: sleep difficulties (Belleville et al., 2009; Germain, 2013; Lamarche & De Koninck, 2007), irritability (Chemtob et al., 1997; Olatunji et al., 2010; Orth & Wieland, 2006), difficulty concentrating (McNally, 2006; Moores et al., 2008; Vasterling et al., 2002; Vasterling, Brailey, Constans, & Sutker, 1998; Vasterling, Constans, et al., 1998), hypervigilance (Buckley et al., 2000; Dalgleish et al., 2001; Kimble et al., 2010; Kimble et al., 2013), and increased startle response (Butler et al., 1990; Guthrie & Bryant, 2005; Morgan et al., 1996; Shalev et al., 2000).

Limited research into the prognostic nature of hyperarousal symptoms indicates that as a criterion, hyperarousal is predictive of both future symptoms and symptom severity (Marshall et al., 2006; Schell et al., 2004). Schell et al. (2004), for example, found that the hyperarousal symptom cluster strongly influenced the development of the criteria of re-experiencing, and avoidance and numbing in a sample of injury survivors. Further, individuals with prominent hyperarousal symptoms at baseline showed lower

overall PTSD symptom improvement compared to those who reported the other clusters as their most prominent symptoms at baseline. A follow-up analysis in 2006, which employed a less severely injured and more ethnically diverse sample, and measured the symptom frequency rather than intensity, found that hyperarousal was a potent predictor of both subsequent hyperarousal and re-experiencing and avoidance and numbing symptoms (Marshall et al., 2006).

What these studies, and previous research has failed to do is to delineate both the occurrence and the impact of this criterion of symptoms post-trauma. The causes behind the manifestation of these five phenomenological entities, which commonly occur in a variety of psychiatric disorders, presenting concurrently following trauma remain largely unexplored, as does how these symptoms define one both another and the recovery experience following trauma.

This thesis extended the paradigm of the post-trauma experience by examining what were the predictors of hyperarousal, how hyperarousal predicted other disorders, the impact of hyperarousal on quality of life and disability and hyperarousal's longitudinal trajectory post-trauma. By filling these gaps in the existing literature, this thesis highlights the great clinical potential of hyperarousal symptoms to be used as a basis of post-trauma screening and early intervention target for individuals who are likely to experience PTSD, as well as further trauma-related psychopathology, and impaired quality of life and disability (B. Litz et al., 2002; Nugent et al., 2006; Schell et al., 2004; Solomon et al., 2009).

7.1. Summary of findings

7.1.1. What factors predict the development of the hyperarousal symptoms?

Whilst hyperarousal has been established as a predictor of further PTSD symptom development (Marshall et al., 2006; Schell et al., 2004; Solomon et al., 2009), no research to date has looked at what predicts the onset of this symptom criterion. Similarly, military samples have long been studied within the context of PTSD, however the course and predictors of *specific* PTSD symptoms experienced by this population have been less well documented. This focus on PTSD within the military developed from the need to understand the problems faced by returning troops following World War Two and subsequent conflicts; however this focus has been more general, with specific effects of military service on discrete PTSD symptom clusters not previously examined.

Prior military research has established that being deployed in a military capacity is a risk factor for PTSD (Hermann et al., 2012). Specifically, the type of deployment, the number and the nature of specific trauma types experienced whilst deployed have all been established as significant risk factors for PTSD development (Fear et al., 2010; C. W. Hoge et al., 2004; C. W. Hoge et al., 2002; Iversen et al., 2008; Sareen et al., 2007). However, how these factors relate to the specific symptoms of PTSD in this population is less well understood. Examination of the specific symptom clusters is important, as it may be that certain symptoms have greater relevance for this population. For example, in a military setting, hyperarousal symptoms in particular can be manifested and perpetuated in a number of ways, specifically reflecting the nature of military service. The constant scanning for threat in the surrounding environment can develop into hypervigilance (Kimble et al., 2013; Steenkamp et al., 2012). Overburdened pathways of working memory and attention due to persistent demand can lead to concentration

difficulties (Reijnen, Rademaker, Vermetten, & Geuze, 2015; Stanley, Schaldach, Kiyonaga, & Jha, 2011). Sleep difficulties such as poor sleep onset, maintenance and quality are commonly reported amongst soldiers whilst deployed (Gilbert, Kark, Gehrman, & Bogdanova, 2015; Peterson, Goodie, Satterfield, & Brim, 2008; Seelig et al., 2010). On deployment, both the violent combat experiences and the constant threat of further traumatic experiences have been linked to increased irritability and aggression (Jakupcak et al., 2007; Killgore et al., 2008). Finally, an increase in physiological reactivity through persistent stress and sensitisation is often observed through increased startle response (Baker et al., 2012; Grillon & Morgan III, 1999; Grillon, Morgan III, Davis, & Southwick, 1998; Guthrie & Bryant, 2005; Schmidt, Kaltwasser, & Wotjak, 2013).

The adaptive nature of hyperarousal symptoms, as a protective factor against potential risk whilst deployed is beneficial for the individual, as a heightened sense of awareness of adverse and potentially life-threatening stimuli enables them to respond quickly and efficiently to threats in the surrounding environment (Kimble et al., 2010; Kimble et al., 2013). However, this constant arousal of the sympathetic nervous system, combined with threat of IEDS (the hallmark of current conflicts in the middle east) as well as repeated exposures and deployments excessively activate this system, potentially causing dysregulation (Smid et al., 2013). This constant overburdening of the nervous system through the cumulative exposure to adverse stimuli and events has been postulated as a precursor for Delayed Onset PTSD, a phenomena which has been observed more frequently in military populations that are exposed to frequent potential trauma (Prigerson, Maciejewski, & Rosenheck, 2001; Smid et al., 2013; Smid, Mooren, van der Mast, Gersons, & Kleber, 2009).

The current study was the first to examine the role of military deployment in the development and onset of one criterion of PTSD symptoms – hyperarousal. By analysing a military sample longitudinally, at both pre and post deployment, it was possible to explore the presentation of hyperarousal symptoms in participants before and after they were exposed to specific traumas, and thus contribute to our knowledge of the role that specific deployment and combat related traumas play in the manifestation of these symptoms in the first few months following return from deployment.

Based on the findings of previous literature, which suggested that the perception of threat whilst on deployment would be a critical factor in predicting PTSD symptoms (Forbes et al., 2014; D. W. King et al., 1999; L. A. King et al., 2008; Vasterling et al., 2010), the initial hypothesis of this study was that deployment traumas that involved the perception of threat would be most significantly predictive of hyperarousal symptoms at post-deployment. However, this was not supported, with the analysis instead finding that all of the deployment specific traumas, rather than only those traumas involving perception of threat, had a significant predictive impact on the presentation of hyperarousal at post-deployment.

Further analysis found that witnessing human degradation was the most significant predictor of hyperarousal amongst not only the deployment specific traumas, but also after accounting for all other predictors of post-deployment hyperarousal (other than symptom presentation prior to deployment). Whilst not consistent with the proposal that specific deployment exposures such as threat may in turn trigger specific hyperarousal symptoms (as described above), these findings do support the proposition that witnessing human degradation is particularly traumatising, instilling impotence and helplessness due to it being so outside the realm of normal human experience (Sareen et al., 2007; Ward, 1997). Further study is required to confirm this proposition,

however, as witnessing human degradation is an experience unlikely to be experienced independently from other traumatic experiences on deployment (such as seeing someone being injured or killed, feeling threatened, or experiencing direct combat), and thus may also be a reflection of a combat environment that is so traumatic through the cumulative burden of a variety of trauma and it is this cumulative burden which is being attributed to one potentially extreme factor.

The cumulative role of trauma whilst deployed was highlighted by the findings that both the number of exposures and number of different exposure *types* were significant predictors of hyperarousal at post-deployment. The odds of meeting hyperarousal following deployment to the MEAO were significantly greater in those who experienced three or more traumas whilst deployed.

Previous research has highlighted the cumulative role that experiencing different traumas types plays in increasing risk for PTSD (Mueser et al., 1998; Vrana & Lauterbach, 1994). More recently, the understanding of the role of cumulative trauma plays in activating sensitisation pathways has been developed, whereby individuals who experience more trauma develop PTSD due to the cumulative burden on their allostatic load by perceived threat to previously non-threatening stimuli in their environment (Green et al., 2000; Suliman et al., 2009). These findings highlight the role of cumulative trauma exposure in the combat environment, and are illustrative of the compounding impact of military service, where both the nature, and the number of traumas experienced whilst on deployment predict greater post-deployment symptomology (Adler et al., 1996; Davy et al., 2012; Dedert, Green, Calhoun, Yoash-Gantz, Taber, Mumford, Tupler, Morey, Marx, Weiner, et al., 2009; C. W. Hoge et al., 2002; McFarlane et al., 2011; Reijnen et al., 2015; Sareen et al., 2007).

Interestingly, when traumatic events that had occurred prior to deployment were examined as predictors of post-deployment symptoms, individuals who reported experiencing *threatening* lifetime traumas were more likely to meet post-deployment hyperarousal. This is consistent with previous research, particularly in the field of interpersonal trauma, which has argued that persistent symptoms of PTSD may develop following traumas involving threat, due to fear conditioning (Forbes et al., 2012; Forbes et al., 2014; Schumm et al., 2006). It may be that traumas involving personal threat *prior* to deployment lower sensitisation thresholds for stressful deployment experiences and additional trauma, and increase the likelihood of hyperarousal following deployment. The enduring impact of prior adversity in this sample is consistent with the theory that sensitisation creates attentional bias to future threat that when exacerbated by future deployment experiences, results in hyperarousal symptoms post-deployment (Lapiz-Bluhm & Peterson, 2014; McFarlane, 2010; Pitman et al., 2012).

The major findings of this study highlighted the cumulative burden of trauma exposure, and the prominent role that previous trauma plays in sensitising an individual toward subsequent trauma exposures and further development of hyperarousal symptoms. Whilst the relationship between threat and hyperarousal is complicated ad was not easily defined by the results of this study, it appears that the early occurrence of lifetime trauma involving threat to personal safety have a significant impact on later symptom development, After establishing these risk factors for hyperarousal development, it is important to understand the impact that these symptoms may have on individuals psychopathology following their deployments. As such, the next study in this thesis aimed to determine whether hyperarousal symptoms are predictors of psychiatric disorder other than PTSD.

7.1.2. Are hyperarousal symptoms a predictor of disorders other than PTSD?

Whilst hyperarousal has been described as central to explaining subsequent PTSD symptom expression post-trauma, the relationship between hyperarousal and the development of psychiatric disorders other than PTSD post-trauma is less well studied.

Previous research has drawn attention to the fact that hyperarousal symptoms are shared phenomena within anxiety and depressive disorders, (Creamer et al., 2001b; Elhai, Biehn, et al., 2011; Elhai, Contractor, et al., 2011). As such, hyperarousal may represent an underlying neurological dysregulation and general symptomatic decline following trauma (Elhai, Contractor, et al., 2011), which is not specific to PTSD. Thus, study 2 was designed to assess the role of hyperarousal in predicting the onset of mental disorders other than PTSD. Given the shared nature of these symptoms amongst disorder, the primary hypothesis was that hyperarousal would be predictive of future Anxiety and Depression diagnoses.

A longitudinal sample of young adults from South Eastern Australia was used to evaluate whether meeting the criteria for hyperarousal was associated with the risk of future onset of DSM-IV affective and anxiety disorders. In these analyses, participants with a prior disorder history were removed from the sample, as previously having a disorder is a well-established risk factor for future symptomology (Kessler et al., 2005; Lewinsohn et al., 1994; Pine et al., 1998). This enabled the examination of the effect of hyperarousal in predicting risk for future anxiety and affective disorder in an otherwise relatively healthy group. In the first analysis, hyperarousal was significantly predictive of MDD and PTSD, and trends in the results suggested that it may also be predictive of other disorders including OCD and PD, with the low numbers of participants in the sample presenting with these disorders limiting the ability to detect statistical

significance. This consistent pattern of associations, across various anxiety disorders is in line with the argument that hyperarousal may be representative of a general dysregulation, which precipitates the development of various psychopathologies (Elhai, Contractor, et al., 2011).

After accounting for cumulative trauma burden, hyperarousal was no longer a significant predictor, again illustrating the importance of lifetime trauma history as a predictor of risk for disorder. Interestingly, Study one, found that number of traumas played a significant role in predicting hyperarousal symptoms – therefore, in the case of Study 2, it is possible that the number of lifetime traumas predicted the development of future disorder *through* the onset of hyperarousal symptoms. Further analysis is needed to delineate the complex relationship between number of trauma exposures, hyperarousal and the onset of PTSD and other disorders.

Whilst not reaching statistical significance, the direction of effects did suggest that in a sample with a higher prevalence of disorder, hyperarousal might emerge as the most significant predictor of disorder. Previous literature has hypothesised that an hyper-aroused response to a traumatic event may be a critical determinant of an individual's risk for developing further psychopathology (McFarlane, 2000; Shalev, 2002). Although not conclusive due to the limited sample size, the results of this study suggest that hyperarousal in otherwise healthy individuals does appear to be associated with the future development of anxiety and depressive disorders.

One explanation for this association is that hyperarousal may represent an enduring reactive state that persists long after trauma, reflecting an individual's inability to modulate their response to stress and restore both psychological and biological homeostasis, increasing their risk for future episodes of both anxiety and affective disorder (McFarlane, 2000, 2010; Shalev, 2002).

The emerging picture from the studies discussed so far is that hyperarousal appears to be implicated in the development of disorder, reflecting a dysregulated state of functioning that is significantly accounted for by the cumulative trauma that is experienced throughout an individual's lifetime. Whilst the significant impact of each of the symptoms of hyperarousal have been studied post-trauma (Dalgleish et al., 2001; Germain, 2013; Gilbert et al., 2015; Guthrie & Bryant, 2005; Kimble et al., 2010; Kimble et al., 2013; Orth et al., 2008; Orth & Wieland, 2006; Schoorl, Putman, Van Der Werff, & Van Der Does, 2013; Shalev et al., 2000), it was unclear how meeting this criteria of symptoms impacted an individual's quality of life and disability following a traumatic experience, particularly in reference to the re-experiencing and avoidance and numbing criteria's of PTSD whose impact post-trauma have been extrapolated further more often within the literature. Thus, the next chapter of this thesis aimed to define the impact of hyperarousal on quality of life and disability following an injury trauma.

7.1.3. How does hyperarousal predict post-trauma quality of life and disability?

Previous research has demonstrated that PTSD diagnosis predicts poorer quality of life following trauma (Johansen et al., 2007; Maguen et al., 2009; Olatunji et al., 2007; Rodriguez et al., 2012). Furthermore, hyperarousal has also been shown to predict post-deployment impairment, overall PTSD symptom severity, life distress, functional impairment and, in the previous study (discussed above), psychopathology other than PTSD (Heir et al., 2010; Maguen et al., 2009; M. T. Shea et al., 2010). Little research, however, has compared the impact of the different symptom clusters of PTSD, and indeed, the overall diagnosis, on quality of life following trauma. Therefore, Study 3 utilised data from an injury sample to investigate the impact of the three PTSD symptom clusters (Avoidance, Intrusion, Hyperarousal) on self-reported quality of life and disability. Recognising the impact that a disorder and its criteria of symptoms have on

an individual's quality of life and functioning is critical in determining the need for intervention on the most debilitating symptoms and tailoring treatment to have the most successful outcomes. Thus, the aim of this chapter was to assess whether meeting criteria for re-experiencing, avoidance and numbing, or hyperarousal, or the overall PTSD diagnosis, had the strongest impact on an individual's quality of life following an injury trauma

The results of this study demonstrated hyperarousal to be more strongly associated with poor quality of life and disability, than either the avoidance/numbing or re-experiencing clusters, or meeting full PTSD diagnosis. This result extends previous literature (e.g. (Heir et al., 2010) by highlighting a stronger impact of hyperarousal on functioning compared to the other two symptoms clusters and suggests that hyperarousal is a driving force in functional impairment following a traumatic experience.

Interestingly, this effect was particularly evident for the more physical quality of life measures (physical, environmental and disability). Previous research by Shea and colleagues (2010) suggested that poorer overall functioning caused by the individual symptoms of hyperarousal (such as poor sleep, irritability, concentration problems) reduce an individual's participants ability to interact and cope with their environment. Symptoms of hyperarousal such as irritability and hypervigilance may reflect a conditioned barrier between the individual and their environment, which over time have a compounding, circular affect on their interaction with their surroundings (i.e. as the symptoms continue, their environment becomes more challenging, thus further exacerbating the presentation of these symptoms).

In the second analysis, common risk factors for quality of life outcomes including age, marital status, employment status, gender, and average pain in the last two weeks

for quality of life were entered along with the PTSD criteria and diagnosis met to further demarcate the role of hyperarousal in quality of life outcomes. Perhaps unsurprisingly, pain replaced hyperarousal as the most significant predictor of quality of life outcomes in this model, despite the fact that hyperarousal remained significant. This supports previous literature, which notes the impact of severity, duration and extent of pain as factors that play a role in impacting quality of life (Niv & Kreitler, 2001; Skevington, 1998). The finding that the effect of hyperarousal was reduced when pain was entered into the model is not surprising, given the established relationship between experiencing pain and the presentation of individual symptoms of hyperarousal (Berryman et al., 2013; Moriarty et al., 2011; Portenoy et al., 2004; M. T. Smith & Haythornthwaite, 2004; M. T. Smith et al., 2000; Straube & Heesen, 2015). Experiencing pain has been associated with sleep difficulties (M. T. Smith & Haythornthwaite, 2004; M. T. Smith et al., 2000; Straube & Heesen, 2015), concentration difficulties (Attridge, Crombez, Van Ryckeghem, Keogh, & Eccleston, 2015; Berryman et al., 2013), and irritability (Husebo, Ballard, Fritze, Sandvik, & Aarsland, 2014; Portenoy et al., 2004). That there is such a close relationship between the experience of pain and symptoms of hyperarousal is to be anticipated, given that they share very similar pathways of sensitisation, whereby a reduced threshold for and increased amplification in response to previous neutral or innocuous stimuli in the environment and/or bodily systems become triggers for experiencing symptoms (Latremoliere & Woolf, 2009).

There appears to be a bidirectional relationship between pain and hyperarousal, as symptoms of PTSD have been shown to predict the presence of pain (Jenewein et al., 2009) and pain has been shown to predict PTSD severity and diagnosis (Norman et al., 2008; Schnyder, Wittmann, Friedrich-Perez, Hepp, & Moergeli, 2008). Further research is needed to assess whether it is to delineate the relationship and shared pathways of pain and hyperarousal, and thus inform whether the clinical intervention and outcomes

of these phenomena are impacted when they occur co-currently or separately in individuals following trauma.

That hyperarousal still had a significant role in an injury-trauma sample when controlling for pain, which is a known impediment to recovery and quality of life, should not be understated (Carty et al., 2011; Norman et al., 2008; Schnyder et al., 2008; Ulvik, Kvåle, Wentzel-Larsen, & Flaatten, 2008). Overall, this study highlighted the role that the symptoms of hyperarousal play as a significant cause of impairment following trauma. These findings are of critical importance to clinical practitioners, providing compelling evidence that the symptoms of hyperarousal should be a focus of post-trauma clinical interventions and assessment of individuals at risk, post-trauma, in order to prevent further psychological burden and disability post-trauma.

Further, these findings support intervention for symptoms of PTSD prior to meeting full diagnostic criteria for the disorder as individual symptom clusters of PTSD, in particular, hyperarousal, were found to have a more significant impact on quality of life and disability than meeting full diagnostic criteria. The monitoring and treatment of symptoms of hyperarousal in populations such as the military, and first responders who are frequently exposed to traumatic events (i.e. police officers or paramedics), may help improve quality of life, job satisfaction and prevent the loss of capability prior to the impairment becoming unmanageable.

Study 1 highlighted the risk factors for the development of hyperarousal, and studies 2 and 3 highlighted hyperarousal's potential as a significant risk factor for development of disorders and as a significant impediment to quality of life and disability following trauma. Despite establishing both the risk for hyperarousal and the psychological burden of meeting this criterion, there remained a gap in the literature as to how this criterion of symptoms developed over time. Given that knowledge into how

this criterion developed over time would potentially allow better treatment and early intervention preventing the onset of these symptoms, study 4 was developed to investigate how hyperarousal develops as a symptom cluster following trauma.

7.1.4. How does Hyperarousal develop as a symptom cluster?

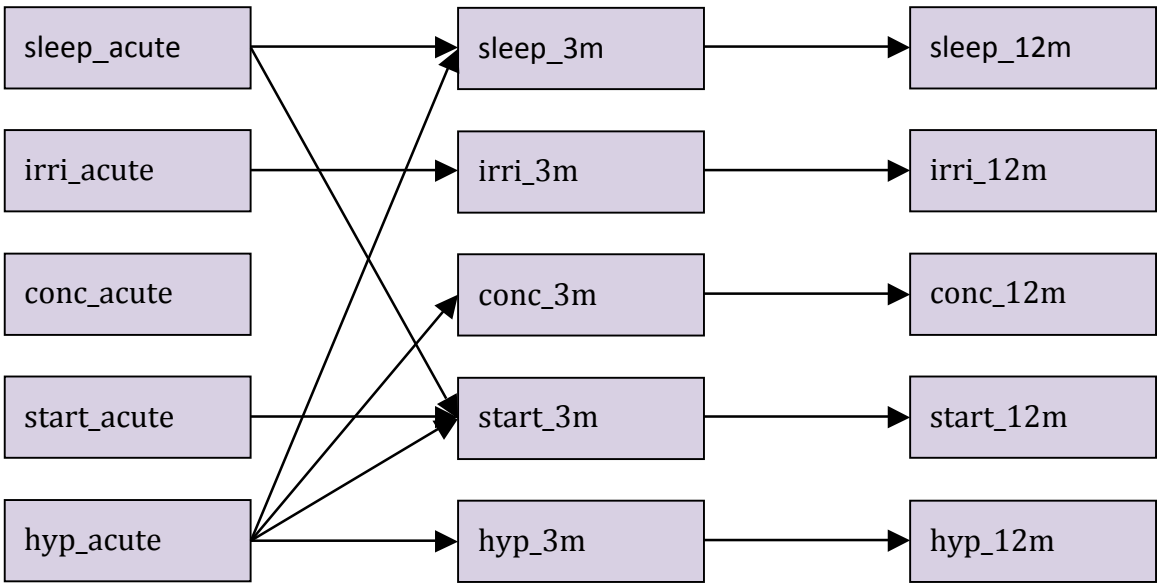


Figure 7.1 Full model summary of hyperarousal symptom interaction over 12-months in the IVS sample (B>.2)

In Study 4, data from the Injury Vulnerability study (which was previously utilised in the quality of life chapter) was utilised to examine how the individual symptoms of hyperarousal emerge with the passage of time and interact with the other symptoms of the criterion. By utilising a series of path analyses to assess the relative strength of the predictive relationships between symptoms at subsequent time points, a novel insight into the manifestation of the hyperarousal cluster was obtained. As expected, the analysis showed that hyperarousal symptoms were more prevalent at baseline and increased significantly across time in those who met diagnosis for PTSD compared to those who did not (chapter 6; figure 6.1). This is consistent with previous literature on symptom trajectories of PTSD, which has found that individuals who meet criteria for PTSD are more likely to report greater acute symptoms and increased symptom severity over time (O'Donnell, Elliot, et al., 2007).

Figure 12.1 above shows the summarises the most significant relationships between the individual symptoms across the twelve month follow up period. As shown, hypervigilance at the acute stage emerged as the strongest predictor of all of the individual hyperarousal symptoms at three months post-trauma including itself (see also chapter 6; figures 6.2-6.7). Previous research has claimed that hypervigilance has an additive and circular effect on individuals post-trauma, whereby as they continuously perceive more threat, they get caught in a growing cycle of disorder maintenance and progression (Dalgleish et al., 2001).In these results, for at least the first three months following trauma, hypervigilance appears to be central to the development of further hyperarousal symptomology. Thus it appears hypervigilance may be a driving symptom of these phenomena, which in itself appears to be at the core of PTSD symptomology (Marshall et al., 2006; Pietrzak et al., 2013; Schell et al., 2004; Solomon et al., 2009). Whilst the results of this study indicate that there is a significant relationship between hypervigilance and future symptoms of hyperarousal, more research is needed to delineate whether hypervigilance is driving internal destabilization into further psychopathology or alternatively, it is simply the first sign of the internal dysregulation that occurs post-trauma.

The finding that hypervigilance predicts other symptoms of hyperarousal suggests that clinical intervention targeting hypervigilant responders may be useful in preventing the development of further PTSD psychopathology. Further research in military populations such as was utilised in the initial study may prove particularly fruitful for delineating the onset of symptom progression through the experience of hypervigilance. Military personnel deployed in a combat environment have been found to develop and maintain hypervigilance as a skill set to ensure safe operating whilst in potentially hostile environments. Whilst the regular scanning for a wide range of threat-related stimuli may prove fruitful in preventing adverse circumstances occurring on

deployments, this learned behaviour has been noted to have adverse consequences amongst returned veterans leaving them unable to fully re-engage with their more peaceful home environments (Dalgleish et al., 2001; Kimble et al., 2010; Kimble et al., 2013). Working with such populations, who are at greater risk for developing hyperarousal through the pathways of what is essentially a self-conditioned fear response, would provide greater insight into the symptoms underlying mechanisms, and the pathways that lead to further hyperarousal symptom development.

Irritability and concentration problems appeared to be secondary responses that were strongly predicted at three months by other acute hyperarousal symptoms. The relatively low impact of these symptoms in the acute to three-month phase of post-trauma recovery may also be a reflection of the time needed for the underlying mechanisms that drive these symptoms to manifest. Acute irritability did have a significant impact on all 12-month symptoms of hyperarousal, suggesting that early irritability may increase an individual's propensity to be sensitised over time, with symptoms manifesting in a delayed manner rather than at the three-month follow-up. The albeit delayed impact of irritability within the hyperarousal cluster supports previous claims that anger in PTSD is a manifestation of an individual's systemic regulatory problem, caused by their inability to actively cope with stimuli in their environment over time, and their preparedness to 'fight' the perceived threat (Olatunji et al., 2010). Previous research has noted that many individuals who appear normal after a traumatic experience eventually become unwell, experiencing a delayed onset of symptoms (McFarlane, 2010). The delayed impact of irritability, compared to the more immediate impact of hypervigilance within the models of hyperarousal, highlights the different neurological progression of symptoms following trauma. Whilst the cause of this progression is unclear, whether it be a result of the natural progression of dysregulated neurobiological pathways following trauma (Herrmann & Eryavec, 1994),

or the progressive activation through further exposure to subsequent environmental stressors or trauma (B. Andrews et al., 2007; Buckley et al., 1996; Carty et al., 2006), these findings highlight the need for symptom focused research in the field of PTSD to gain a deeper understanding into the nature of symptom progression post-trauma .

From three months to twelve months post-trauma, there was a more dynamic interplay of symptom interaction, with no single symptom appearing to drive the ongoing development of the cluster. This finding supports the paradigm of dynamic expression of PTSD whereby symptoms constantly change within an individual, until they eventually become consolidated over time (Chapter 6, figures 6.7-6.14). Given that hyperarousal has been shown to increase symptom severity and predict the onset and maintenance of other symptoms of PTSD, it is of critical importance both theoretically and clinically to understand how such a critical cluster forms over time (Marshall et al., 2006; Pietrzak et al., 2013; Schell et al., 2004; Solomon et al., 2009). The contribution of this study was to breakdown the cluster of hyperarousal into its five separate symptoms and assess how they develop and manifest over time. This research suggests that hypervigilance is a critical early predictor of later hyperarousal symptoms, and therefore is a potential high-value target in terms of clinical intervention in assessing individuals at risk of PTSD following a trauma and preventing the further onset or development of disorder.

7.2. Implications

The results presented in this thesis highlights how and why hyperarousal develops, and its the prominent role in the post-trauma recovery process. The identification of the important role that hyperarousal symptoms play post-trauma in predicting both further disorder and poorer quality of life outcomes has a number of benefits for established practices. Hyperarousal symptoms are readily identifiable as a potential target for early

intervention and treatment, which may prevent an individual from potentially developing further symptomology of hyperarousal and other PTSD criteria (Marshall et al., 2006; Schell et al., 2004; Solomon et al., 2009) (Study 4), further psychopathology (Study 2), and allow for a better quality of life and functioning following the experience of a traumatic event (Study 3).

This thesis took the first step in identifying risk factors for the development for hyperarousal, finding that number of deployment traumas and cumulative lifetime trauma played a significant role in increasing risk for the development of hyperarousal. Understanding the role of the cumulative burden, which comes with repeated trauma exposure, as explained by sensitization models, is critical for understanding the development of hyperarousal, PTSD, and other psychiatric disorders (Green et al., 2000; Pitman et al., 2012; Suliman et al., 2009). Both our results and that of previous studies highlight the need for increased monitoring and support services to be provided for individuals in roles which expose them to repeated trauma, such as our first responder communities (police, fire and ambulance officers) and military personnel.

The early identification and treatment of individuals presenting with hyperarousal symptoms following trauma may prevent the development of poorer post-trauma outcomes including the development of further disorder and poorer quality of life and disability. Certain populations, such as the military, already administer the post trauma checklist to all personnel following deployments, and thus have the ability to readily identify participants who are potentially at greater risk and monitor these individuals. Such screening using self report measures in populations exposed to frequent trauma are potentially more cost effective, by treating sub-syndromal individuals before they reach more clinically significant levels of disorder.

In addition to being an early warning sign of poorer psychological health following trauma, the hyperarousal symptoms are some of the most easily observable symptoms to the family members, friends, comrades in arms, and even clinicians of those suffering post-trauma. Whilst some of the re-experiencing symptoms and avoidance and numbing symptoms can sometimes be purposefully hidden by the individual due to their nature as internal cognitions and experiences, the symptoms of hyperarousal are readily identifiable to those who are in contact with an individual regularly through the behavioural changes through which they manifest. This can include increased startle response in reaction to loud noises; disturbed sleep, the inability to concentrate, and increased irritability in everyday activities. Better training and information regarding symptom recognition for service providers and support networks, in particular for other veterans and the families of victims of traumas, will build a better post trauma risk management system through the early identification of those who may be at risk of developing further disorder. Early identification of hyperarousal symptoms may be of particular relevance to organisations such as the military and other first responders as they are likely to experience more traumatic experiences due to the nature of their work, and thus are at greater risk for sensitisation through cumulative exposure (a risk factor highlighted by study 1) (Pitman et al., 2012; Post & Weiss, 1998; Smid et al., 2013). Given that the number of traumatic exposures and prior lifetime experiences emerged as significant risk factors for the development of hyperarousal symptoms, it seems pertinent to enter into a discourse of whether psychological fitness for duty needs to include reactivity and the monitoring of acute arousal responses following deployments and/or shift rotations.

Objective measurement of hyperarousal symptoms for first responders may be a better option for preventing symptomology in persons who are continually exposed to traumatic experiences. Startle response can be effectively measured objectively using

autonomic and physiological responses to auditory stimuli (Grillon & Baas, 2003; Grillon & Morgan III, 1999; Grillon et al., 1998; Shalev et al., 2000), and symptoms of concentration difficulties and hypervigilance can be measured via neuropsychological tests of working attention, memory and learning performance (Aupperle, Melrose, Stein, & Paulus, 2012; Vasterling et al., 2002; Vasterling, Brailey, et al., 1998). Objective measurement of these phenomena also removes any protective reporting biases that may occur in individuals who deliberately report lower or non-existent symptoms following trauma in order to continue in their current roles (i.e. the military example of not wishing to be deemed non-deployable with their unit). The "screening" for symptom development following trauma would allow earlier treatment and symptom management thus preventing long-term development of symptomology.

The treatment of hyperarousal symptoms in the aftermath of trauma could prevent the development of further psychological disorder and impaired quality of life following trauma. Whether this treatment is through the administration of medication (such as adrenergic blockers) (E. A. Hoge et al., 2012; Vaiva et al., 2003), cognitive behavioural therapy (Cahill et al., 2003; Hinton et al., 2004), exposure therapy (F. G. Morrison & Ressler, 2014; Paunovic & Öst, 2001; Resick, Nishith, Weaver, Astin, & Feuer, 2002; Taylor et al., 2003), eye movement desensitisation and reprocessing therapy (Boccia, Piccardi, Cordellieri, Guariglia, & Giannini, 2015; Taylor et al., 2003), or a combination of these therapy practices, it is important to mediate the effects of hyperarousal in the earliest stages following trauma.

Recent Australian guidelines endorsed by the Australian Psychological Society, the Royal Australian College of General Practitioners, and The Royal Australian and New Zealand College of Psychiatrists for treating PTSD have indicated that many of the trauma-focused evidence-based treatments available for PTSD today are largely

equivalent (Australian Centre for Posttraumatic Mental Health, 2013). The different rationales of trauma-focused therapies vary in their emphasis on traumatic memories, traumatic reminders, or cognitive restructuring. Whilst the theory and mechanisms of change underlying these different approaches requires further scrutiny through systematic, peer-reviewed research, the many variants of trauma-focused interventions allows for a range of evidence-based treatment options should symptoms not respond to the first treatment option (Australian Centre for Posttraumatic Mental Health, 2013).

EMDR and CBT are two of the proven evidence-based treatments options for clinicians treating patients presenting with symptoms of PTSD. EMDR has been proven to be particularly efficacious in treating intrusive symptoms (Chen et al., 2014), which is not surprising given its basis in information-processing theory; whereby an individual's troubling memories are addressed by having the client focus on the distressing event. In this way, it is similar to CBT, in that both processes activate the fear memory network, and introduce corrective information that breaks down the consolidation of the fear structure (Chen et al., 2014). Despite the focus of CBT, EMDR and exposure therapy in addressing memory restructuring and consolidation, a randomized study of the differential effects of exposure therapy and cognitive therapy found that they had no significant differential effect on the individual symptom clusters of PTSD (Horesh, Qian, Freedman, & Shalev, 2016). The authors postulated that as a result their findings suggest that the clusters of PTSD may respond best to treatment in an inter-related fashion, with the reduction in one cluster reducing the presentation of the others (Horesh et al., 2016).

In contrast, an alternative paradigm suggests that the early management of hyperarousal and its emergence may modify the consolidation and chronicity of the full range of PTSD symptoms. The findings of this thesis and the previously discussed

literature which explores the aetiology of PTSD symptom cluster manifestation suggests that early intervention on these symptoms be of greater benefit early in the course of the disorder, rather than at later time points when the clusters have become more stable and chronic (Marshall et al., 2006; Schell et al., 2004). Previous research has shown that trauma focused therapies such as CBT are effective in treating early symptoms presentations of PTSD (Roberts, Kitchiner, Kenardy, & Bisson, 2009; Shalev et al., 2016). Further research is required, however, to provide insight as to how these treatments can best be utilised (either alone or in conjunction with other assistive treatments) to treat early symptoms of hyperarousal and whether such early post-trauma intervention on individuals presenting with hyperarousal criteria alone can prevent the onset of further PTSD symptom presentation and severity.

Despite questions over their efficacy, pharmacological treatments are often prescribed for patients with PTSD, and may yet prove fruitful in treating symptoms of hyperarousal in the early phases of post-trauma recovery. Pharmacological interventions, such as the administration of the steroid hydrocortisone, have been shown effective in secondary prevention of PTSD if administered in the immediate aftermath of trauma (Zohar et al., 2011). Treatments utilising glucocorticoids have found that the early administration of these medication are protective against later PTSD through limitation of fear conditioning following trauma (Bryant, Creamer, O'Donnell, Silove, & McFarlane, 2009; Holbrook, Galarneau, Dye, Quinn, & Dougherty, 2010).

Specific antidepressants may also be effective in moderating the effect of early symptoms of hyperarousal. Prazosin and Clonidine, which target adrenergic activity in the central nervous system, have been shown to effectively reduce some PTSD symptoms, in particular difficulties with sleep (Steckler & Risbrough, 2012).

Furthermore, sedating atypical antipsychotic agents, such as olanzapine, quetiapine, and risperidone, have shown potential as adjunctive treatments in reducing the symptoms of hyperarousal (Steckler & Risbrough, 2012).

The findings presented in this thesis have highlighted the need for the targeted treatment of hypervigilance in the early stages of trauma recovery to prevent the further development of the hyperarousal criterion. Previous literature has noted the impact of administering adrenergic blockers (such as propanolol) to mediate the effects of reactions produced by cognitive appraisals of threat following trauma, such as hypervigilance (E. A. Hoge et al., 2012; Vaiva et al., 2003). Despite promising results in earlier trials, problems of un-replicable and conflicting results regarding the use of propanolol have had a negative impact on the administration of this medication in the aftermath of trauma (Kearns, Ressler, Zatzick, & Rothbaum, 2012). Further research into the targeted pharmacological treatment of specific symptoms and PTSD criteria, such as the prescription of adrenergic blockers to patients presenting with hypervigilance in the initial months post-trauma, may prove significant in preventing the development of both hyperarousal and PTSD symptomology.

More recently, the emergence of neurofeedback as a treatment option for PTSD has proven significant in helping patients recover from PTSD. A non-invasive treatment, neurofeedback teaches individuals to deactivate areas of the brain activated by the stress response using real-time displays of their own brain activity, allowing them to self-regulate into a calmer state (Reiter, Andersen, & Carlsson, 2016). This deactivation of specific pathways may provide a more targeted approach to treating the underlying neurobiology of hyperarousal that has occurred through fear conditioning and sensitisation. The first pilot study to asses a non-veteran PTSD sample found that neurofeedback significantly reduced PTSD Symptoms in chronic sufferers, and

decreased the presentation of all three symptom clusters of PTSD (Gapen et al., 2016). As noted by the authors of this study, an important future direction in the study of neurofeedback as a treatment option for PTSD is the exploration of different protocols for different PTSD symptom profiles (Gapen et al., 2016). Considering both the findings of this thesis and previous literature which support the role of hyperarousal in the development of further PTSD symptomology, neurofeedback which trains subsyndromal patients to deactivate hyperaroused regions of the brain may prove highly significant in preventing the onset of PTSD following a traumatic experience.

Physical activity, such as yoga and exercise, has been promoted as a successful adjunct therapy in treating PTSD symptomology. An effective treatment in the general population, Physical activity has been found to alleviate comorbid conditions of PTSD including cardiovascular disease and depression (Rosenbaum et al., 2015). In particular, Yoga has been found to be effective in both reducing PTSD symptom severity and loss of diagnosis (Rhodes, Spinazzola, & van der Kolk, 2016), and in one randomised trial, significantly reducing the presentation of hyperarousal symptoms (Mitchell et al., 2014). Whilst the effect of Physical exercise in modulating PTSD symptoms is currently unclear, there is sufficient evidence of the benefits of physical therapy to warrant its inclusion in treatment profiles, and for further exploration as to its benefit as a treatment for specific symptom criteria of PTSD.

An alternative treatment modality that specifically targets hypervigilance symptomology is Attention Training Techniques (ATT). Promoting focused attention and reduced visual scanning for potentially threatening stimuli in the environment, ATT offers an alternative, and perhaps the most promising, treatment specifically for those presenting with hypervigilance following trauma. In their exploration of the role of selective attention and hypervigilance for threat in anxiety Richards et al., (2014)

suggest that ATT's that promote focused attention and reduce monitoring of a wider attentional field would reduce hypervigilance through improved focus on only relevant stimuli. Cusmano (2016) concluded that such attention training in clinical practice may help ameliorate symptoms of PTSD. However, further research is required to prove the efficacy of such training models in clinical practice, particularly in individuals who are presenting with subclinical levels of disorder.

Whether such interventions prove useful, this study has highlighted the need and relevance for symptom based research regarding PTSD symptoms and targeted interventions to further inform and improve upon clinical practice (Fleeson et al., 2010; Schmidt, 2015).

7.3. Limitations of this research

The main limitation of this thesis is that a large portion of the data utilised was based on self-report. Whilst every effort was made to use gold standard measures of PTSD and other symptomology measures within the studies of this thesis, there are some limitations that must be addressed in regards to the instruments used. The use of self-report measures is an obvious source of error, which is commonly associated with the use of non-clinician administered assessment measures. Thus, whilst the Post-Trauma Checklist which was utilised for Study 1 is a widely used, and clinically supported, measure of PTSD symptoms, additional research is needed using a structured diagnostic interview to establish symptoms of PTSD and hyperarousal in the military context (MacDonald et al., 2013).

Study 3 also utilised self-report data, in the collection of quality of life and disability related items through the presentation of the WHO-QoL BRIEF (Group, 1998; Skevington et al., 2004) and the WHO DAS. Whilst the psychometric properties of these instruments are sound and the instruments are well validated (Inset Refs (Gholami et al.,

2013; Group, 1998; Skevington, 1998; Skevington et al., 2004)), The use of clinician administered quality of life and disability measures would overcome any artefacts of self-report measures (Williamson, 2007). The use of self-report data is common practice in large epidemiological samples, however, as they are more cost effective and easier to administer to a larger population than the time challenges and accompanied costs with assessing such a large population utilising a clinician-administered measure.

The degree of comorbidity between symptoms of hyperarousal with other mental disorders requires further exploration. Sleep disturbances, irritability and concentration problems are common phenomena in those with anxiety and affective disorders, as well as those with a history of alcohol and drug use (Chang et al., 1997; Olatunji et al., 2010; Sivertsen et al., 2014; Wong & Brower, 2012; Wong et al., 2004). The results of the analyses presented in study 2 (hyperarousal predicting other disorder) suggest that symptoms of hyperarousal following trauma may reflect a state of dysregulation activated by the experience of trauma, which in turn create a generalized risk for the future onset of new episodes disorder (Kendall-Tackett, 2000; McFarlane, 2000; Shalev, 2002; Veling et al., 2013). Taken together, these findings highlight the issue of common substrates of disorder as against the trauma driven phenomenology. Rather than being specific to PTSD, hyperarousal appears to be a reflection of dysregulation to shared biological pathways that lead to multiple psychiatric disorders (Network & Consortium, 2015). More recently, the psychiatric community has begun to understand the heterotypic continuity that exists between disorders, in which psychopathology has both unique and shared etiologies and mechanisms (Lahey, Zald, Hakes, Krueger, & Rathouz, 2014; Network & Consortium, 2015). Further examination of hyperarousal in this context, will enable a greater understanding of the nature of the biological mechanisms and shared neurological substrates that lead to psychopathology (Etkin & Wager, 2007; Goodkind et al., 2015; Lahey et al., 2014; Network & Consortium, 2015).

7.3.1. Sample limitations

As is common with longitudinal research, the samples utilised for this research were subject to decreasing response rates and missing data over time (see chapter 2) (Gustavson, von Soest, Karevold, & Røysamb, 2012). Whilst this is discussed in detail in the samples chapter of this thesis (Chapter 2), it is important to note that despite being expected and higher than the than the average for such large epidemiological studies, there was participant attrition over the course of these studies. A number of previous studies have examined attrition rates in epidemiological and psychiatric research, noting that individuals with poorer socio demographic factors (i.e. are unmarried, unemployed, lower education), unhealthy life style factors (i.e. higher alcohol consumption, smoking, physical inactivity), less social support, and higher levels of psychological distress are significantly more likely to drop out of research studies the longer they continue (Allott, Chanen, & Yuen, 2006; Badawi, Eaton, Myllyluoma, Weimer, & Gallo, 1999; Cotter, Burke, Stouthamer-Loeber, & Loeber, 2005; Gustavson et al., 2012; Tambs et al., 2009; Torvik, Rognmo, & Tambs, 2012). This was also true with the samples used in this thesis, with those who were retained throughout subsequent follow-ups generally being healthier, exhibiting better functioning and less psychological disorder than those lost to attrition (see chapter 2 for responder vs. non-responder analysis). Whilst this is important to note, the large size and diversity of trauma within these samples is still valuable in studying the risk factors and outcomes surrounding hyperarousal, even when accounting for attrition.

7.3.2. Design limitations

In study 1, a choice was made to focus on just the hyperarousal criteria of PTSD. Whilst claims can be made about how certain deployment exposures predict hyperarousal pre and post-deployment, it is unclear how these factors influence other symptoms of PTSD in this sample and if they are distinctive predictors of hyperarousal

or common predictors of PTSD symptomology in general. Future investigation into which factors have the most significant impact on the presentation of each criteria of PTSD symptoms, both independently and con-currently, in deployed samples would provide a greater context and understanding of the challenges faced by deployed personnel.

In Study 2, in which hyperarousal was analysed as a predictor of mental disorder other than PTSD, a potential limitation was the expanse of time between the presentation and measurement of hyperarousal symptoms and the later recording of episodes of disorder. The eight years time period, which elapsed between measurement of symptoms and outcomes, was valuable in allowing analysis of the long-term outcomes of hyperarousal, however, it is possible that in the short term the nature of the relationship between hyperarousal and future disorder is significantly different. It is also plausible that extraneous factors, such as symptoms remitting, or patients seeking professional treatment within this timeframe may have impacted the observed outcomes. Therefore, whilst hyperarousal does appear to significantly contribute to disorder in the long term, more research is needed to further explore the intricacies of this relationship.

The results of study 3 are limited by the cross-sectional analysis of data at twelve months following the individual's trauma admission. Whilst hyperarousal played a significant role in predicting quality of life and disability at this time point it is possible that the same inferences of causality may significantly vary at different times post-trauma. Just as previous research has shown symptomology and the trajectories of symptoms and recovery to fluctuate over a period of time, it is possible that quality of life is more adversely affected by different symptoms as they in turn fluctuate and change longitudinally. Future studies of the impact of hyperarousal on individuals

quality of life and functioning in the more acute stages of trauma would help delineate the relationship between this symptom cluster and outcomes and the need for clinical intervention at different time points.

Study 4 is the first study to examine the temporal sequence of the individual hyperarousal symptoms. As it is the first to explore the nature of how the symptoms of hyperarousal predict one another over time, providing insight into the development of the symptom cluster and the prominent role of hypervigilance in the clusters development, there is no current comparable literature with which to substantiate the claims made by this study. It is possible that the nature of the sample (i.e. that the sample was predominantly motor vehicle accident injuries) impacted the presentation and relationships observed between the hyperarousal symptoms. Further research into these observations using a variety of different samples and trauma types is needed to assess whether our claims can be applied more globally following trauma or are more specific to our injury sample.

7.4. Recommendations for future research

Previous literature have suggested that hyperarousal is the driving criterion of PTSD, which promotes the occurrence and maintenance of symptoms of avoidance and numbing, and re-experiencing (Marshall et al., 2006; Pietrzak et al., 2013; Schell et al., 2004; Solomon et al., 2009). This thesis expanded on this previous work by showing the significant role hyperarousal plays in predicting quality of life and disability following trauma, as well as future episodes of psychopathology other than PTSD. Previous work by Elhai et al (2011) has shown that hyperarousal can be divided into sub sections of dysphoric symptoms (sleep difficulties, irritability, and concentration problems). Their work supported the division of the hyperarousal cluster into fear based physiological reactions (startle response and hypervigilance) and dysphoric arousal symptoms which

appear to stand on their own as a distinct construct. Whether dividing hyperarousal symptoms into unique factors might influence the findings of this thesis remain to be seen. For example, it is possible that one or more symptoms is responsible for the quality of life outcomes, or in driving the uptake of further disorder, rather than the criteria as a whole. The findings of the final study suggest that perhaps hypervigilance plays a more prominent role in the uptake of the dysphoric symptoms in the early stages following trauma, although further research is needed to delineate both these relationships and the appropriateness of dividing the hyperarousal criteria into further sub-groups. Nevertheless, future research should explore whether individual symptoms of hyperarousal, or combinations of symptoms, have key predictive relationships with other symptom manifestations within PTSD and other psychopathology. The exploration of the neurological and biological underpinnings of these phenomena would also provide a better understanding of post-trauma sequelae and prove insightful for clinical practice.

Further, in the newly published DSM-5 an additional symptom has been added to the hyperarousal criterion (American Psychiatric Association, 2013). The symptom is 'reckless or self-destructive behaviour', which was added to the DSM-IV criteria of hyperarousal to add the 'fight' dimension to the 'fight or flight' response often seen produced by traumatic experiences (American Psychiatric Association, 2013). With the inclusion of this symptom into this dynamic cluster, continued research is needed to assess how it impacts the model of hyperarousal and post-trauma sequelae that has been developed within this thesis.

This research took a significant step in breaking down what it is about the nature of a single military deployment that impacts the recruitment of symptoms of hyperarousal in study 1. However, future research assessing the role of these

deployment specific factors in predicting all symptoms and symptom clusters of PTSD, using clinician administered assessments of PTSD symptoms, would provide greater insight into how deployment traumas influence PTSD psychopathology.

Study 2 and 3 established the need to consider the significant role that hyperarousal plays post-trauma in predicting episodes of further disorder, and as a significant predictor of poorer quality of life and functioning. Future research should aim to delineate symptoms within the PTSD clusters, particularly hyperarousal, to determine how the symptoms have an individual impact on post trauma outcomes and functioning, rather than assigning significance to the overall criterion. Previous research has suggested that it may be possible to delineate the hyperarousal cluster into distinct groups of symptoms that reflect underlying cognitive processes, thus these symptoms may in turn have different effects on quality of life and functioning post trauma (Elhai, Biehn, et al., 2011).

7.5. Final thoughts

This thesis is a substantial building block for future research into what has been identified as the driving cluster of PTSD (Marshall et al., 2006; Pietrzak et al., 2013; Schell et al., 2004; Solomon et al., 2009). Number of traumas and previous lifetime disorder were identified as significant predictors of hyperarousal, although further research is needed in a less gender-specific, non-military sample to determine whether this result can be generalised to a civilian population. With the identification of the significant role that hyperarousal has on quality of life and disability following traumas, and as a predictor of future episodes of disorder, there is a clearer direction and need for future research into this symptom cluster as a critical determinant of post-trauma sequelae. Hypervigilance in particular, deserves greater attention and investigation within the literature, as the symptom that appears to be driving the emergence of

further symptoms of hyperarousal that are reflective of the various neurobiological systems that are vulnerable to dysregulation post-trauma.

8. Reference List

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9. Appendices

9.1. MEAO Prospective Health Study Questionnaire, Physical and Neurocognitive Testing Consent Form

MEAO Prospective Health Study Questionnaire, Physical and Neurocognitive Testing Consent Form

I ……..give my consent to participate in:

(please circle below the parts of the study you wish to consent to)

➢ ***ALL PARTS OF THE STUDY*** including all procedures and linking of personal information as described below

Yes / No

OR

➢ ***THE FOLLOWING PARTS ONLY:***

- Completing the Middle East Area of Operations (MEAO) Prospective Health Study Questionnaire approximately 3 months before my deployment and again 4 months after my deployment **Yes / No**
- Allowing linkage of information contained in electronic ADF health records (e.g. Health-Keys) with the study data **Yes / No**
- Allowing linkage of information contained in my electronic ADF psychological screening records with the study data **Yes / No**
- Allowing linkage to information held in other health registries including cancer registries and other health registry systems as outlined in the information sheet **Yes / No**
- A physical assessment 3 months before deployment and again 4 months after deployment as described in the information sheet **Yes / No**
- Providing a blood and saliva sample 3 months before deployment and again 4 months after deployment as described in the information sheet **Yes / No**

- Performing a neurocognitive test 3 months before deployment and again 4 months after deployment as described in the information sheet **Yes / No**
- Being contacted for follow-up studies **Yes / No**
- Allowing CMVH to obtain ADF contact details of any listed partner/spouse so that they may be invited to participate in a family study **Yes / No**

My consent is provided on the following basis:

- I have read the MEAO Prospective Health Study Questionnaire, Physical and Neurocognitive Testing information sheet provided to me about the aims of this research, how it will be conducted and my role in it AND the supplementary information sheet for physical and neurocognitive testing that details the testing to be conducted.
- I understand the risks involved as described in the information sheet.
- I am cooperating in this project on the condition that:
    - My personal information and details will be kept confidential.
    - The information that is collected for this study will only be used for the Military Health Outcomes Program or MilHOP research.
    - My participation will be from the commencement date to the end date specified on this form, or to the end of this project (June 2012). I can elect to withdraw from the project at any time.
- I can discuss my participation at any time with the Principal Investigator, a Research Team Member or a representative of one of the relevant Ethics Committees.
- I understand that Defence and DVA are interested in understanding the impacts of deployments and service life. Further studies may include: telephone interviews and family studies.
    - I understand that CMVH is conducting a family study this year and I allow CMVH to use family contact information held by the ADF to invite my family to participate if selected. My family will be able to decide whether they wish to participate at the time of contact.

I understand that:

- There is no obligation to take part in this study.
- If I choose not to participate there will be no detriment to my career, future health care, service pension, DVA pension or compensation claims.
- I am free to withdraw from the study at any time. If I do, there is no detriment to my career, future health care, service pension, DVA pension or compensation claims.
- My answers will be completely confidential and any personal details, which may identify me in any way, will not be passed to the Department of Veterans' Affairs or the Department of Defence. My answers will not in any way affect my pension, benefits or any health services I am entitled to from DVA.
- I can, at any time, withdraw my consent to participate in the project. Should I withdraw my consent, I can do so by contacting the study team at the Centre for Military and Veterans' Health on 1800 232 904 (free call) or cmvh@adelaide.edu.au

✓ I have kept a copy of the information and consent sheet, signed by me for my

records.

- ✓ I have also been given a copy of Australian Defence Human Research Ethics Committee's (ADHREC) *Guidelines for Volunteers*.
- ✓ The study report will be made available to me at my request and any published reports of this study will preserve my anonymity.

Please forward results and findings to:

- ❒ My email address
- ❒ My home address

Participant Signature: _____

Name in Full: _____

Date: _____

Please sign and return to the Centre for Military and Veterans' Health

MEAO Prospective Health Study Questionnaire, Physical and Neurocognitive Testing Consent Form

I ……..give my consent to participate in:

(please circle below the parts of the study you wish to consent to)

➢ ***ALL PARTS OF THE STUDY*** including all procedures and linking of personal information as described below **Yes / No**

OR

➢ ***THE FOLLOWING PARTS ONLY:***

- Completing the Middle East Area of Operations (MEAO) Prospective Health Study Questionnaire approximately 3 months before my deployment and again 4 months after my deployment **Yes / No**
- Allowing linkage of information contained in electronic ADF health records (e.g. Health-Keys) with the study data **Yes / No**
- Allowing linkage of information contained in my electronic ADF psychological screening records with the study data **Yes / No**
- Allowing linkage to information held in other health registries including cancer registries and other health registry systems as outlined in the information sheet **Yes / No**
- A physical assessment 3 months before deployment and again 4 months after deployment as described in the information sheet **Yes / No**
- Providing a blood and saliva sample 3 months before deployment and again 4 months after deployment as described in the information sheet **Yes / No**
- Performing a neurocognitive test 3 months before deployment and again 4 months after deployment as described in the information sheet **Yes / No**
- Being contacted for follow-up studies **Yes / No**
- Allowing CMVH to obtain ADF contact details of any listed partner/spouse so that they may be invited to participate in a family study **Yes / No**

My consent is provided on the following basis:

- I have read the MEAO Prospective Health Study Questionnaire, Physical and Neurocognitive Testing information sheet provided to me about the aims of this research, how it will be conducted and my role in it AND the supplementary information sheet for physical and neurocognitive testing that details the testing to be conducted.
- I understand the risks involved as described in the information sheet.
- I am cooperating in this project on the condition that:
    - My personal information and details will be kept confidential.
    - The information that is collected for this study will only be used for the Military Health Outcomes Program (MilHOP) research.
    - My participation will be from the commencement date to the end date specified on this form, or to the end of this project (June 2012). I can elect to withdraw from the project at any time.
- I can discuss my participation at any time with the Principal Investigator, a Research Team Member or a representative of one of the relevant Ethics Committees.
- I understand that Defence and DVA are interested in understanding the impacts of deployments and service life. Further studies may include: telephone interviews and family studies.
    - I understand that CMVH is conducting a family study this year and I allow CMVH to use family contact information held by the ADF to invite my family to participate if selected. My family will be able to decide whether they wish to participate at the time of contact.

I understand that:

- There is no obligation to take part in this study.
- If I choose not to participate there will be no detriment to my career, future health care, service pension, DVA pension or compensation claims.
- I am free to withdraw from the study at any time. If I do, there is no detriment to my career, future health care, service pension, DVA pension or compensation claims.
- My answers will be completely confidential and any personal details, which may identify me in any way, will not be passed to the Department of Veterans' Affairs or the Department of Defence. My answers will not in any way affect my pension, benefits or any health services I am entitled to from DVA.
- I can, at any time, withdraw my consent to participate in the project. Should I withdraw my consent, I can do so by contacting the study team at the Centre for Military and Veterans' Health on 1800 232 904 (free call) or cmvh@adelaide.edu.au

✓ I have kept a copy of the information and consent sheet, signed by me for my records.

✓ I have also been given a copy of Australian Defence Human Research Ethics Committee's (ADHREC) *Guidelines for Volunteers*.

✓ The study report will be made available to me at my request and any published

reports of this study will preserve my anonymity.

Please forward results and findings to:

- ❒ My email address

- ❒ My home address

Participant Signature: _____

Name in Full: _____

Date: _____

Please detach and retain for your records

9.2. MEAO Prospective study pre-deployment questionnaire

CMVH
CENTRE FOR MILITARY & VETERANS' HEALTH

MilHOP
Military Health Outcomes Program

Middle East Area of Operations (MEAO) Prospective Health Study Pre Deployment Questionnaire

Part 1: Brief Deployment History

Part 2: Pre Deployment Health Questionnaire

Part 3: Personality and Resilience Insert

For the purposes of this study, deployment to the Middle East Area of Operations includes:

- Deployment to Iraq or areas supporting operations in Iraq;
- Deployment to Afghanistan or areas supporting operations in Afghanistan.

For more information please refer to the instructions on the following page. If you are still uncertain regarding your eligibility to participate in this study, please contact the study team on 1800 232 904 or email cmvh@adelaide.org.au

Instructions to complete this questionnaire:

This questionnaire asks about your physical and mental health. All information you provide in this questionnaire will be de-identified and will not be linked to other data we have collected about your health without your consent.

Please complete all sections by following the instructions at the beginning of each question. Please **shade circles**, rather than ticking or crossing them, and write clearly and in **capital letters**.

Shade Circles Like This--> ●

Not Like This--> ⊗ ✓

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

If you make a mistake and wish to change your answer, simply cross out your mistake and choose the answer that is right for you.

Please use **blue or black pen**, not pencil.

Some questions may seem repetitive, but this is necessary due to the questions being grouped into scales.

If you have any questions, please call us on 1800 232 904.

SUPPORT

If you require support in regards to anything in this questionnaire, please refer to the contacts provided below:

ALL HOURS SUPPORT LINE (a confidential telephone triage support service for ADF members and their families)
1800 628 036; outside Australia +61 2 9425 3878

LIFELINE
13 11 14

VETERANS AND VETERANS' FAMILY COUNSELLING SERVICE
1800 011 046

VETERANS' AFFAIRS NETWORK (VAN)
1300 551 918; non-metro 1800 555 254

DEPARTMENT OF VETERANS' AFFAIRS
13 32 54

NATIONAL OFFICE FOR THE MILITARY COMPENSATION AND REHABILITATION SERVICE
1300 550 461

For questions, problems or concerns, or to have your name removed from the mailing list please contact:

THE STUDY TEAM: The Centre for Military and Veterans' Health
Freecall 1800 232 904; cmvh@adelaide.edu.au

FIRST CHIEF INVESTIGATOR: Professor Annette Dobson, University of Queensland
(07) 3365 5346; a.dobson@uq.edu.au

If you prefer to speak to an independent officer of the Universities or Defence Force not involved in the study, you may contact an ethics officer on the numbers listed below:

THE AUSTRALIAN DEFENCE HUMAN RESEARCH ETHICS COMMITTEE
Executive Secretary: (02) 6266 3837; ADHREC@defence.gov.au

THE UNIVERSITY OF ADELAIDE RESEARCH BRANCH
Secretary, Human Research Ethics Committee: (08) 8303 6028

THE DEPARTMENT OF VETERANS' AFFAIRS HUMAN RESEARCH ETHICS COMMITTEE
HREC Coordinator: (02) 6289 6204; ethics.committee@dva.gov.au

Part 1:
Brief Deployment History

Brief Deployment History - MEAO

1.1 Have you been on an ADF operational deployment? (war-like, peacekeeping, peace-monitoring or humanitarian support)

O Yes O No - **please skip to question 1.7**

Instructions: Please indicate which of the following major operations you have been deployed on (*please complete as much of this information as you can*).

1.2 Deployments to MEAO

COUNTRY	OPERATION NAME	YEAR(S) DEPLOYMENT(S) STARTED	NO. OF TIMES DEPLOYED IN YEAR	TOTAL TIME DEPLOYED (MONTHS)
O Afghanistan or areas supporting operations in Afghanistan	O OP SLIPPER	O 2001		
		O 2002		
		O 2003		
		O 2004		
		O 2005		
		O 2006		
		O 2007		
		O 2008		
		O 2009		
		O 2010		

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ID:

Brief Deployment History - MEAO

COUNTRY	OPERATION NAME	YEAR(S) DEPLOYMENT(S) STARTED	NO. OF TIMES DEPLOYED IN YEAR	TOTAL TIME DEPLOYED (MONTHS)
O Iraq or areas supporting operations in Iraq	O OP BASTILLE	O 2002		
		O 2003		
	O OP FALCONER	O 2003		
	O OP CATALYST	O 2003		
		O 2004		
		O 2005		
		O 2006		
		O 2007		
		O 2008		
		O 2009		
	O OP KRUGER	O 2009		
		O 2010		

Thinking about your most recent deployment to the MEAO:

1.3 Did you feel pressure from your unit to volunteer for this deployment?

- O Yes, formal chain of command
- O Yes, mates within Unit
- O No
- O Not applicable

1.4 When you deployed, did you deploy with your parent unit?

- O Yes
- O No, but I deployed with some members from my Unit
- O No, I didn't know anyone I deployed with
- O Not applicable, did not have a parent unit

If NO:

a) Did you feel you were treated any differently than members of the host unit?

- O No, I was treated the same as the members of the host Unit
- O Yes, I was treated better than the members of the host Unit
- O Yes, I was treated worse than the members of the host Unit

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ID:

Brief Deployment History - Other Deployments

1.5 Other Deployments:

COUNTRY	OPERATION NAME	YEAR(S) DEPLOYMENT(S) STARTED	NO. OF TIMES DEPLOYED IN YEAR	TOTAL TIME DEPLOYED (MONTHS)
○ Solomon Islands	○ OP ANODE	○ 2003		
		○ 2004		
		○ 2005		
		○ 2006		
		○ 2007		
		○ 2008		
		○ 2009		
		○ 2010		

Brief Deployment History - Other Deployments

COUNTRY	OPERATION NAME	YEAR(S) DEPLOYMENT(S) STARTED	NO. OF TIMES DEPLOYED IN YEAR	TOTAL TIME DEPLOYED (MONTHS)
O East Timor	O InterFET, OP FABER, OP SPITFIRE, OP WARDEN	O 1999		
		O 2000		
	O OP TANAGER	O 2000		
		O 2001		
		O 2002		
	O OP CITADEL	O 2002		
		O 2003		
		O 2004		
	O OP SPIRE	O 2004		
		O 2005		
		O 2006		
		O 2007		
	O OP ASTUTE, OP CHIRON, OP TOWER	O 2005		
		O 2006		
		O 2007		
		O 2008		
		O 2009		
		O 2010		

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ID:

Brief Deployment History - Other Deployments

COUNTRY	OPERATION NAME	YEAR(S) DEPLOYMENT(S) STARTED	NO. OF TIMES DEPLOYED IN YEAR	TOTAL TIME DEPLOYED (MONTHS)
O Bougainville	O OP BEL ISI I	O 1997		
		O 1998		
	O OP BEL ISI II	O 1999		
		O 2000		
		O 2001		
		O 2002		
		O 2003		

1.6 What other Operations have you been deployed on (war like, peacekeeping, peace-monitoring or humanitarian support), including UN missions (e.g. OP Palate, OP Riverbank), Humanitarian Missions (e.g. OP Pakistan Assist, OP Sumatra Assist), secondments to foreign militaries (e.g. OP Enduring Freedom, OP Herrick), and border protection (e.g. Op Resolute)? If you have depolyed on more than 10 other Operations, please enter your 10 longest.

COUNTRY	OPERATION NAME	YEAR DEPLOYMENT STARTED	NO. OF TIMES DEPLOYED IN YEAR	TOTAL TIME DEPLOYED (MONTHS)

Brief Deployment History

1.7 Have you worked in the Middle East in a role outside of the ADF (e.g. as a security contractor or for an NGO)? ○ Yes ○ No

If YES:

COUNTRY (If you do not remember or do not wish to report this please write NA)	COMPANY NAME (If you do not remember or do not wish to report this please write NA)	YEAR STARTED	NO. OF TIMES WORKED IN THIS LOCATION IN YEAR	TOTAL TIME WORKED IN THIS LOCATION (MONTHS)

Part 2:
Pre-deployment
Health Questionnaire

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ID:

Section One: Background Details

1.1 What is today's date? (dd/mm/yyyy) / /

1.2 Are you male or female? O Male O Female

1.3 What is your date of birth? (dd/mm/yyyy) / /

1.4 Are you currently in a significant intimate relationship?
O Yes - go to question 1.4a
O No - go to question 1.4b

1.4a Are you:
- O Married and living together
- O Married with unaccompanied spouse (i.e. married partner currently lives elsewhere)
- O Living with partner (ADF recognised)
- O Living with partner (not ADF recognised)
- O In a long term relationship but not living together

1.4b Are you:
- O Never married
- O Previously married but now divorced
- O Previously married but now separated
- O Other, please specify:

1.5 Were you in a significant intimate relationship ONE YEAR AGO?
O Yes - go to question 1.5a
O No - go to question 1.5b

1.5a Were you:
- O Married and living together
- O Married with unaccompanied spouse (i.e. married partner currently lives elsewhere)
- O Living with partner (ADF recognised)
- O Living with partner (not ADF recognised)
- O In a long term relationship but not living together

1.5b Were you:
- O Never married
- O Previously married but now divorced
- O Previously married but now separated
- O Other, please specify:

1.6 How satisfied are you with your marriage / relationship?
- O Extremely satisfied
- O Satisfied
- O Neither satisfied or dissatisfied
- O Dissatisfied
- O Extremely dissatisfied
- O Not applicable

1.7 Have you or your spouse / partner ever seriously suggested the idea of divorce or permanent separation within the LAST YEAR? O Yes O No O Not applicable

Section One: Background Details

1.8 Overall, what impact have your military commitments (now, or in the past if you have left the military) had on your:

a) Marriage / relationship?
- O No impact
- O Positive impact
- O Negative impact
- O Not applicable

b) Children?
- O No impact
- O Positive impact
- O Negative impact
- O Not applicable

1.9 Which category best describes the highest educational qualification you have completed? Choose one.
- O Primary school
- O Secondary school up to grade 10
- O Secondary school grades 11-12
- O Certificate (trade, apprenticeship, technicians etc)
- O Diploma (associate, undergraduate)
- O Bachelor degree
- O Post-graduate qualification

1.10 How many hours per week are you in paid employment, when you are not on deployment? | | | | hours

1.11 To the nearest year, how long have / had you served with the Australian Defence Force: (if more than 0, but less than 1 year, please enter 1)

a) As a regular? | | | years *or* O Not applicable

b) As a reservist? | | | years *or* O Not applicable

1.12 What is your CURRENT rank or what WAS your rank when you left the military?
- O Senior Commissioned Officer (CMDR / LTCOL / WGCDR and above)
- O Commissioned Officer (LCDR / MAJ / SQNLDR and below)
- O Senior Non-Commissioned Officer (PO / SGT and above)
- O Junior Non-Commissioned Officer (LS / CPL and below)
- O Other ranks (AB / SMN / PTE / LAC / AC or equivalent)

1.13 In the past THREE YEARS, roughly how many months in total have you been away on Operational deployment? (if more than 0, but less than 1 month, please enter 1) | | months

If you are still a member of the regular Australian Defence Force, please go to Section Two.

If you are a Reservist or have discharged from the regular Australian Defence Force, please complete the following questions.

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ID:

Section One: Background Details

1.14 What year did you discharge from the Regular Australian Defence Force?

or

O Not applicable, I am a Reservist

1.15 Did you discharge to the Reserves or out of the ADF completely? O Reserves O Out of ADF O Not applicable, I have always been a reservist

1.16 What is your current employment status?

O Paid employment full-time
O Paid employment part-time / casual
O Volunteer / community work
O Student
O Home Duties
O Retired
O Not working due to ill-health / TPI
O Unemployed
O Other, please specify:

1.17 Since you separated from the ADF, have you had a period of unemployment greater than 3 months? O Yes O No O Not applicable

If YES, was this period of unemployment primarily due to health problems? O Yes O No

If YES, please specify type:

1.18 What is your main source of income now? Choose one.

O Wage or salary
O Own business or share in a partnership
O Age Service pension
O Invalidity Service Pension
O Compensation benefit under the VEA
O Compensation benefit under the SRCA
O Compensation benefit under the MRCA
O Other government pension / allowance / benefit
O Child allowance
O Superannuation / annuity
O Dividends / interest / income from investments
O Other, please specify:

Section Two: Recent Health Symptoms

We would like to know about your health in the past month. Please indicate whether or not you have suffered any of the following symptoms in the past month, and if so, please indicate whether your symptoms were mild, moderate or severe in nature.

In the past month have you suffered from:	NO	YES		
2.1 Chest pain	O No	O Mild	O Moderate	O Severe
2.2 Headaches	O No	O Mild	O Moderate	O Severe
2.3 Rapid heartbeat	O No	O Mild	O Moderate	O Severe
2.4 Irritability / outbursts of anger	O No	O Mild	O Moderate	O Severe
2.5. Unable to breathe deeply enough	O No	O Mild	O Moderate	O Severe
2.6 Faster breathing than normal	O No	O Mild	O Moderate	O Severe
2.7 Feeling short of breath at rest	O No	O Mild	O Moderate	O Severe
2.8 Wheezing	O No	O Mild	O Moderate	O Severe
2.9 Sleeping difficulties	O No	O Mild	O Moderate	O Severe
2.10 Feeling jumpy / easily startled	O No	O Mild	O Moderate	O Severe
2.11 Feeling unrefreshed after sleep	O No	O Mild	O Moderate	O Severe
2.12 Fatigue	O No	O Mild	O Moderate	O Severe
2.13 Double vision	O No	O Mild	O Moderate	O Severe
2.14 Intolerance to alcohol	O No	O Mild	O Moderate	O Severe
2.15 Itchy or painful eyes	O No	O Mild	O Moderate	O Severe
2.16 Rash or skin irritation	O No	O Mild	O Moderate	O Severe
2.17 Skin infections e.g. boils	O No	O Mild	O Moderate	O Severe
2.18 Skin ulcers	O No	O Mild	O Moderate	O Severe
2.19 Shaking	O No	O Mild	O Moderate	O Severe
2.20 Tingling in fingers and arms	O No	O Mild	O Moderate	O Severe
2.21 Tingling in legs and toes	O No	O Mild	O Moderate	O Severe
2.22 Numbness in fingers / toes	O No	O Mild	O Moderate	O Severe
2.23 Feeling distant or cut off from others	O No	O Mild	O Moderate	O Severe
2.24 Constipation	O No	O Mild	O Moderate	O Severe
2.25 Flatulence or burping	O No	O Mild	O Moderate	O Severe

Section Two: Recent Health Symptoms

In the past month have you suffered from:	NO	YES		
2.26 Stomach cramps	O No	O Mild	O Moderate	O Severe
2.27 Diarrhoea	O No	O Mild	O Moderate	O Severe
2.28 Indigestion	O No	O Mild	O Moderate	O Severe
2.29 Dry mouth	O No	O Mild	O Moderate	O Severe
2.30 Pain in the face, jaw, in front of the ear, or in the ear	O No	O Mild	O Moderate	O Severe
2.31 Persistent cough	O No	O Mild	O Moderate	O Severe
2.32 Lump in throat	O No	O Mild	O Moderate	O Severe
2.33 Sore throat	O No	O Mild	O Moderate	O Severe
2.34 Forgetfulness	O No	O Mild	O Moderate	O Severe
2.35 Dizziness, fainting or blackouts	O No	O Mild	O Moderate	O Severe
2.36 Seizures or convulsions	O No	O Mild	O Moderate	O Severe
2.37 Feeling disorientated	O No	O Mild	O Moderate	O Severe
2.38 Loss of concentration	O No	O Mild	O Moderate	O Severe
2.39 Difficulty finding the right word	O No	O Mild	O Moderate	O Severe
2.40 Pain on passing urine	O No	O Mild	O Moderate	O Severe
2.41 Passing urine more often	O No	O Mild	O Moderate	O Severe
2.42 Burning sensation in the sex organs	O No	O Mild	O Moderate	O Severe
2.43 Loss of interest in sex	O No	O Mild	O Moderate	O Severe
2.44 Problems with sexual functioning	O No	O Mild	O Moderate	O Severe
2.45 Increased sensitivity to noise	O No	O Mild	O Moderate	O Severe
2.46 Increased sensitivity to light	O No	O Mild	O Moderate	O Severe
2.47 Increased sensitivity to smells or odours	O No	O Mild	O Moderate	O Severe
2.48 Ringing in the ears	O No	O Mild	O Moderate	O Severe
2.49 Avoiding doing things or situations	O No	O Mild	O Moderate	O Severe
2.50 Pain, without swelling or redness, in several joints	O No	O Mild	O Moderate	O Severe
2.51 Joint stiffness	O No	O Mild	O Moderate	O Severe
2.52 Feeling that your bowel movement is not finished	O No	O Mild	O Moderate	O Severe

Section Two: Recent Health Symptoms

In the past month have you suffered from:	NO	YES		
2.53 Changeable bowel function (mixture of diarrhoea / constipation)	O No	O Mild	O Moderate	O Severe
2.54 General muscle aches or pains	O No	O Mild	O Moderate	O Severe
2.55 Loss of balance or coordination	O No	O Mild	O Moderate	O Severe
2.56 Difficulty speaking	O No	O Mild	O Moderate	O Severe
2.57 Low back pain	O No	O Mild	O Moderate	O Severe
2.58 Night sweats which soak the bed sheets	O No	O Mild	O Moderate	O Severe
2.59 Feeling feverish	O No	O Mild	O Moderate	O Severe
2.60 Tender or painful swelling of lymph glands in neck, armpit or groin	O No	O Mild	O Moderate	O Severe
2.61 Loss of, or decrease in, appetite	O No	O Mild	O Moderate	O Severe
2.62 Nausea	O No	O Mild	O Moderate	O Severe
2.63 Vomiting	O No	O Mild	O Moderate	O Severe
2.64 Distressing dreams	O No	O Mild	O Moderate	O Severe
2.65 Stomach bloating	O No	O Mild	O Moderate	O Severe
2.66 Unintended weight gain greater than 4kg	O No	O Mild	O Moderate	O Severe
2.67 Unintended weight loss greater than 4kg	O No	O Mild	O Moderate	O Severe

Section Two: Recent Health Symptoms

2.68 During your lifetime, did you experience any of the following events?		
Blast or Explosion IED (improvised explosive device)	O No	O Yes
RPG (rocket propelled grenade), Land Mine, Grenade, etc.	O No	O Yes
Vehicular accident / crash (any vehicle, including aircraft)	O No	O Yes
Fragment wound or bullet wound above the shoulders	O No	O Yes
Fall	O No	O Yes

If NO to all events in 2.68: please skip to question 3.1. Otherwise, continue.

2.69 How many times in total have you experienced each of the following symptoms immediately after any of the events listed above?	
Loss of consciousness / "knocked out"	☐☐ times
Being dazed, confused, or "seeing stars"	☐☐ times
Not remembering the event	☐☐ times
Concussion	☐☐ times
Head injury	☐☐ times

2.70 Did any of the following problems begin or get worse after any of the events listed above?					
Memory problems or lapses	O No	O Yes	Irritability	O No	O Yes
Balance problems or dizziness	O No	O Yes	Headaches	O No	O Yes
Sensitivity to bright light	O No	O Yes	Sleep problems	O No	O Yes

2.71 In the past week, have you had any of these symptoms?					
Memory problems or lapses	O No	O Yes	Irritability	O No	O Yes
Balance problems or dizziness	O No	O Yes	Headaches	O No	O Yes
Sensitivity to bright light	O No	O Yes	Sleep problems	O No	O Yes

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Section Three: Your Health Now

This next set of questions ask for your views about your health. This information will help you to keep track of how you feel and how well you are able to do your usual activities.

For each of the following questions, please shade the circle that best describes your answer.

3.1 In general, how would you say your health is? O Excellent O Very good O Good O Fair O Poor

3.2 The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?	O Yes, limited a lot	O Yes, limited a little	O No, not limited at all
Climbing several flights of stairs?	O Yes, limited a lot	O Yes, limited a little	O No, not limited at all

3.3 During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	ALL OF THE TIME	MOST OF THE TIME	SOME OF THE TIME	A LITTLE OF THE TIME	NONE OF THE TIME
Accomplished less than you would like	O	O	O	O	O
Were limited in the kind of work or other activities	O	O	O	O	O

3.4 During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

	ALL OF THE TIME	MOST OF THE TIME	SOME OF THE TIME	A LITTLE OF THE TIME	NONE OF THE TIME
Accomplished less than you would like	O	O	O	O	O
Did work or other activities less carefully than usual	O	O	O	O	O

3.5 During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

O Not at all O A little bit O Moderately O Quite a bit O Extremely

3.6 These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks...

	ALL OF THE TIME	MOST OF THE TIME	SOME OF THE TIME	A LITTLE OF THE TIME	NONE OF THE TIME
Have you felt calm and peaceful?	O	O	O	O	O
Did you have a lot of energy?	O	O	O	O	O
Have you felt downhearted and depressed?	O	O	O	O	O

3.7 During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives etc.)?

O All of the time O Most of the time O Some of the time O A little of the time O None of the time

Section Three: Your Health Now

In general, how would you rate your:	EXCELL-ENT	VERY GOOD	GOOD	FAIR	POOR
3.8 Overall health?	○	○	○	○	○
3.9 Quality of life?	○	○	○	○	○
3.10 Eyesight (with glasses or contact lenses, if you wear them)?	○	○	○	○	○
3.11 Hearing?	○	○	○	○	○
3.12 Memory?	○	○	○	○	○
3.13 Teeth and gums?	○	○	○	○	○

The following questions inquire about how you have been feeling over the last four (4) weeks. Please read each question carefully and then indicate, by shading the circle, the response that best describes how you have been feeling.	ALL OF THE TIME	MOST OF THE TIME	SOME OF THE TIME	A LITTLE OF THE TIME	NONE OF THE TIME
3.14 In the past four (4) weeks, about how often did you feel tired for no good reason?	○	○	○	○	○
3.15 In the past four (4) weeks, about how often did you feel nervous?	○	○	○	○	○
3.16 In the past four (4) weeks, about how often did you feel so nervous that nothing could calm you down?	○	○	○	○	○
3.17 In the past four (4) weeks, about how often did you feel hopeless?	○	○	○	○	○
3.18 In the past four (4) weeks, about how often did you feel restless or fidgety?	○	○	○	○	○
3.19 In the past four (4) weeks, about how often did you feel so restless that you could not sit still?	○	○	○	○	○
3.20 In the past four (4) weeks, about how often did you feel depressed?	○	○	○	○	○
3.21 In the past four (4) weeks, about how often did you feel that everything was an effort?	○	○	○	○	○
3.22 In the past four (4) weeks, about how often did you feel so sad that nothing could cheer you up?	○	○	○	○	○
3.23 In the past four (4) weeks, about how often did you feel worthless?	○	○	○	○	○

Section Three: Your Health Now

The next few questions are about how these feelings may have affected you in the past four (4) weeks. You need not answer these questions if you answered 'None of the time' to all of the previous ten questions about your feelings.

3.24 In the past four (4) weeks, how many days were you TOTALLY UNABLE to work, study or manage your day to day activities because of these feelings? | | days

3.25 [Aside from those days], in the past four (4) weeks, HOW MANY DAYS were you able to work or study or manage your day to day activities, but had to CUT DOWN on what you did because of these feelings? | | days

3.26 In the past four (4) weeks, how many times have you seen a doctor or any other health professional about these feelings? | | times

3.27 In the past four (4) weeks, how often have physical health problems been the main cause of these feelings?

O None of the time O A little of the time O Some of the time O Most of the time O All of the time

3.28 Please rate the following statements based on how you have felt in the past 30 days using the scale below.

	NOT TRUE AT ALL	RARELY TRUE	SOME-TIMES TRUE	OFTEN TRUE	TRUE NEARLY ALL THE TIME
a) I am able to adapt to change	O	O	O	O	O
b) I tend to bounce back after illness or hardship	O	O	O	O	O

Section Three: Your Health Now

We would like to know if you have ever been diagnosed by a medical doctor and treated in the last 12 months for any of the following medical problems or conditions.

	YES	NO
3.29 High blood pressure	○	○
3.30 Migraines	○	○
3.31 Bowel disorder e.g. diarrhoea, constipation, bleeding	○	○
3.32 Eye or vision problems e.g. glaucoma	○	○
3.33 Hearing loss	○	○
3.34 Malaria	○	○
3.35 Any other significant infections, please specify type:	○	○
3.36 Arthritis or rheumatism	○	○
3.37 Back or neck problems	○	○
3.38 Joint problems	○	○
3.39 Asthma	○	○
3.40 Bronchitis	○	○
3.41 Sinus problems	○	○
3.42 Hay fever	○	○
3.43 Ear infection	○	○
3.44 Dermatitis	○	○
3.45 Any other skin problem, please specify type:	○	○
3.46 Skin cancer e.g. squamous cell or basal cell skin cancers	○	○
3.47 Any other kind of cancer, tumour or malignancy, please specify type:	○	○
3.48 Anxiety, stress or depression	○	○
3.49 Post traumatic stress disorder	○	○

Section Three: Your Health Now

	YES	NO
3.50 Other psychiatric or psychological condition needing treatment or counselling, please specify type:	○	○
3.51 Any other medical condition, please specify type:	○	○

Section Four: Lifestyle Behaviours

4.1 In the past year, have you used any of the following tobacco products?

	NO	YES
a. Cigarettes	O	O
b. Cigars	O	O
c. Pipes	O	O
d. Smokeless tobacco (e.g. chew, dip, snuff)	O	O

4.2 In your lifetime, have you smoked at least 100 cigarettes (5 packs)?

O No - **please skip to question 4.9**

O Yes - **continue to next question**

4.3 At what age did you start smoking? ☐☐ years old

4.4 How many years have you, or did you, smoke an average of at least 3 cigarettes per day (or one pack per week)? ☐☐ years

4.5 When smoking, how many packs per day did you, or do you, smoke?

O Less than half a pack per day
O Half to 1 pack per day
O 1 to 2 packs per day
O More than 2 packs per day

4.6 Have you ever tried to quit smoking?

O Yes, and succeeded
O Yes, but not successfully
O No

4.7 If you have ever deployed, was your smoking pattern different while on deployment?

O I have never deployed
O I did not smoke on deployment
O I smoked less than usual while on deployment
O I smoked the same amount on deployment as when not deployed
O I smoked more than usual while on deployment
O I began / restarted smoking on deployment

4.8 If your smoking pattern changed during your deployment, what was the main reason?

Section Four: Lifestyle Behaviours

4.9. How often do you have a drink containing alcohol?	Never	Monthly or Less	2 to 4 times a month	2 to 3 times a week	4 or more times a week
	O	O	O	O	O

In answering the following questions, please remember that a standard drink contains 10g of pure alcohol

4.10 How many 'standard' drinks (see above) containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more	N/A
	O	O	O	O	O	O

	NEVER	LESS THAN MONTHLY	MONTHLY	WEEKLY	DAILY OR ALMOST DAILY
4.11 How often do you have six or more drinks on one occasion?	O	O	O	O	O
4.12 How often during the last 12 months have you found that you were not able to stop drinking once you had started?	O	O	O	O	O
4.13 How often during the last 12 months have you failed to do what was normally expected from you because of drinking?	O	O	O	O	O

Section Four: Lifestyle Behaviours

	NEVER	LESS THAN ONCE A MONTH	MONTHLY	WEEKLY	DAILY OR ALMOST DAILY
4.14 How often during the last 12 months have you needed a drink in the morning to get yourself going after a heavy drinking session?	○	○	○	○	○
4.15 How often during the last 12 months have you had a feeling of guilt or remorse after drinking?	○	○	○	○	○
4.16 How often during the last 12 months have you been unable to remember what happened the night before because you had been drinking?	○	○	○	○	○

4.17 Have you or someone else been injured as a result of your drinking?	No ○	Yes, but not in the last 12 months ○	Yes, during the last 12 months ○
4.18 Has a relative, a friend, a doctor or other health professional been concerned about your drinking or suggested you cut down?	No ○	Yes, but not in the last 12 months ○	Yes, during the last 12 months ○

4.19 Do you presently have a problem with drinking?	No ○	Probably not ○	Unsure ○	Possibly ○	Definitely ○

4.20 In the next 3 months, how difficult would you find it to cut down or stop drinking?	Very easy ○	Fairly easy ○	Neither difficult nor easy ○	Fairly difficult ○	Very difficult ○	N/A ○

4.21 On an average day, how many 250 - 375ml beverages containing caffeine do you drink (such as caffeine containing energy drinks, coffee, tea, coca-cola)?

○ None ○ 1-2 per day ○ 3-5 per day ○ 6-10 per day ○ 11 or more per day

Section Four: Lifestyle Behaviours

4.22 Do you currently take any of the following supplements?

a) Body building supplements (such as amino acids, weight gain products, creatine, etc.)

O Never O Less than once a month O Monthly O Weekly O Daily or almost daily

If YES, what was the name (generic or brand name) of the supplement that you used?

b) Energy supplements (such as energy drinks, pills, or energy enhancing herbs)

O Never O Less than once a month O Monthly O Weekly O Daily or almost daily

If YES, what was the name (generic or brand name) of the supplement that you used?

c) Weight loss supplements

O Never O Less than once a month O Monthly O Weekly O Daily or almost daily

If YES, what was the name (generic or brand name) of the supplement that you used?

In the last 12 months...

	NEVER	SOMETIMES	MOST OF THE TIME	ALMOST ALWAYS
4.23 Have you bet more than you could really afford to lose?	O	O	O	O
4.24 Have you needed to gamble with larger amounts of money to get the same feeling of excitement?	O	O	O	O
4.25 When you gambled, did you go back another day to try to win back the money you lost?	O	O	O	O
4.26 Have you borrowed money or sold anything to get money to gamble?	O	O	O	O
4.27 Have you felt that you might have a problem with gambling?	O	O	O	O
4.28 Has gambling caused you any health problems, including stress or anxiety?	O	O	O	O
4.29 Have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?	O	O	O	O
4.30 Has your gambling caused any financial problems for you or your household?	O	O	O	O
4.31 Have you felt guilty about the way you gamble or what happens when you gamble?	O	O	O	O

Section Five: Life Experiences

Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please read each one carefully, then shade the circle to the right to indicate how much you have been bothered by that problem in the past month.

	NOT AT ALL	A LITTLE BIT	MODERA-TELY	QUITE A BIT	EXTREM-ELY
5.1 Repeated, disturbing memories, thoughts or images of a stressful experience from the past?	○	○	○	○	○
5.2 Repeated, disturbing dreams of a stressful experience from the past?	○	○	○	○	○
5.3 Suddenly acting or feeling as if a stressful experience from the past were happening again (as if you were reliving it)?	○	○	○	○	○
5.4 Feeling very upset when something reminded you of a stressful experience from the past?	○	○	○	○	○
5.5 Having physical reactions (e.g. heart pounding, trouble breathing, sweating) when something reminded you of a stressful experience from the past?	○	○	○	○	○
5.6 Avoiding thinking about or talking about a stressful experience from the past or avoiding having feelings related to it?	○	○	○	○	○
5.7 Avoiding activities or situations because they reminded you of a stressful experience from the past?	○	○	○	○	○
5.8 Trouble remembering important parts of a stressful experience from the past?	○	○	○	○	○
5.9 Loss of interest in activities that you used to enjoy?	○	○	○	○	○
5.10 Feeling distant or cut off from other people?	○	○	○	○	○
5.11 Feeling emotionally numb or being unable to have loving feelings for those close to you?	○	○	○	○	○
5.12 Feeling as if your future somehow will be cut short?	○	○	○	○	○
5.13 Trouble falling or staying asleep?	○	○	○	○	○
5.14 Feeling irritable or having angry outbursts?	○	○	○	○	○
5.15 Having difficulty concentrating?	○	○	○	○	○
5.16 Being "superalert" or watchful or on guard?	○	○	○	○	○
5.17 Feeling jumpy or easily startled?	○	○	○	○	○

Section Five: Life Experiences

Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please read each one carefully, then shade the circle to the right to indicate how much you have been bothered by that problem in the past month.

	NOT AT ALL	A LITTLE BIT	MODERA-TELY	QUITE A BIT	EXTREM-ELY
5.17a Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?	O	O	O	O	O
5.17b Blaming yourself or someone else severely for the stressful experience or what happened after it?	O	O	O	O	O
5.17c Having strong negative feelings such as fear, horror, anger, guilt, or shame?	O	O	O	O	O
5.17d Taking too many risks or doing things that cause you harm?	O	O	O	O	O

5.18 Thinking of the event(s) that you used to answer questions 5.1 - 5.17d, please list these events and the years they occurred below.

	Event description	Year
1		
2		
3		

5.19 Did this occur while deployed to the MEAO? O Yes O No

5.20 **If NO**, did this occur during another overseas deployment? O Yes O No

5.21 Is there any other event that has caused you to have similar reactions?
O No
O Yes - while deployed
O Yes - while NOT deployed

If yes, what was that event?

Year of event

Section Five: Life Experiences

5.22 Thinking over the past 4 weeks, shade the circle that best describes the amount of time you felt that way.

	NONE OF THE TIME	A LITTLE OF THE TIME	SOME OF THE TIME	MOST OF THE TIME	ALL OF THE TIME
a) I found myself getting angry at people or situations	O	O	O	O	O
b) When I got angry, I got really mad	O	O	O	O	O
c) When I got angry, I stayed angry	O	O	O	O	O
d) When I got angry at someone, I wanted to hit them	O	O	O	O	O
e) My anger interfered with my ability to get my work, study or other productive activity done	O	O	O	O	O
f) My anger prevented me from getting along with people as well as I'd have liked to	O	O	O	O	O
g) I became angry at myself when I did not perform as well or achieve what I wanted	O	O	O	O	O
h) I became angry at myself when I did not handle social situations as well as I wanted	O	O	O	O	O
i) My anger had a bad effect on my health	O	O	O	O	O

5.23 How often over the last month did you get into a fight with someone and hit the person?

O Never O One time O Two times O Three or four times O Five or more times

5.24 How often over the last month did you threaten someone with physical violence?

O Never O One time O Two times O Three or four times O Five or more times

Section Five: Life Experiences

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 EVERY DAY
5.25 Little interest or pleasure in doing things	O	O	O	O
5.26 Feeling down, depressed, or hopeless	O	O	O	O
5.27 Trouble falling or staying asleep, or sleeping too much	O	O	O	O
5.28 Feeling tired or having little energy	O	O	O	O
5.29 Poor appetite or overeating	O	O	O	O
5.30 Feeling bad about yourself, or that you are a failure, or have let yourself or your family down	O	O	O	O
5.31 Trouble concentrating on things, such as reading the newspaper or watching television	O	O	O	O
5.32 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	O	O	O	O
5.33 Thoughts that you would be better off dead or of hurting yourself in some way	O	O	O	O

5.34 If you checked off any of these problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

O Not difficult at all O Somewhat difficult O Very difficult O Extremely difficult

The next group of questions are about anxiety.

	NO	YES
5.35 In the last 4 weeks, have you had an anxiety attack - suddenly feeling fear or panic?	O	O
If NO: please skip to question 5.50		
5.36 Has this ever happened before?	O	O
5.37 Do some of these attacks come suddenly out of the blue - that is, in situations where you don't expect to be nervous or uncomfortable?	O	O
5.38 Do these attacks bother you a lot or are you worried about having another attack?	O	O

Section Five: Life Experiences

Think about your last bad anxiety attack.

	NO	YES
5.39 Were you short of breath?	○	○
5.40 Did your heart race, pound, or skip?	○	○
5.41 Did you have chest pain or pressure?	○	○
5.42 Did you sweat?	○	○
5.43 Did you feel as if you were choking?	○	○
5.44 Did you have hot flushes or chills?	○	○
5.45 Did you have nausea or an upset stomach, or the feeling that you were going to have diarrhoea?	○	○
5.46 Did you feel dizzy, unsteady, or faint?	○	○
5.47 Did you have tingling or numbness in parts of your body?	○	○
5.48 Did you tremble or shake?	○	○
5.49 Were you afraid you were dying?	○	○

Over the last 4 weeks, how often have you been bothered by any of the following problems?

	NOT AT ALL	SEVERAL DAYS	MORE THAN HALF THE DAYS
5.50 Feeling nervous, anxious, on edge, or worrying a lot about different things	○	○	○
If NOT AT ALL: please skip to question 5.57			
5.51 Feeling restless so that it is hard to sit still	○	○	○
5.52 Getting tired very easily	○	○	○
5.53 Muscle tension, aches, or soreness	○	○	○
5.54 Trouble falling asleep or staying asleep	○	○	○
5.55 Trouble concentrating on things, such as reading a book or watching TV	○	○	○
5.56 Becoming easily annoyed or irritable	○	○	○

Section Five: Life Experiences

Please shade the circles that best describe your experience.		
5.57 In the last 12 months, have you ever felt that life was not worth living?	O No	O Yes
5.58 In the last 12 months, have you ever felt so low that you thought about committing suicide?	O No	O Yes
5.59 In the last 12 months, have you made a suicide plan?	O No	O Yes
5.60 In the last 12 months, have you attempted suicide?	O No	O Yes

If you require support in relation to any issues you have identified in this survey, we encourage you to refer to the contacts provided on Page 3.

Section Six: Your Respiratory Health

The following questions ask you about any respiratory symptoms you may have experienced in the past 12 months.

	NO	YES
6.1 Have you had wheezing or whistling in your chest at any time in the last 12 months?	○	○
If YES:		
a. Have you been at all breathless when the wheezing noise was present?	○	○
b. Have you had this wheezing or whistling when you did not have a cold?	○	○
6.2 Have you woken up with a feeling of tightness in your chest at any time in the last 12 months?	○	○
6.3 Have you been woken by an attack of shortness of breath at any time in the last 12 months?	○	○
6.4 Have you been woken by an attack of coughing at any time in the last 12 months?	○	○
6.5 Have you had an attack of asthma in the last 12 months?	○	○
6.6 Are you currently taking any medicine for asthma (including inhalers, aerosols, or tablets)?	○	○
6.7 Do you have any nasal allergies including hay fever?	○	○

Section Seven: Your Reproductive History

7.1 Have you and your partner (current or previous) ever had problems with infertility (tried to get pregnant for more than 12 consecutive months without success)?

- O Never tried to get pregnant **- please skip to Section Eight**
- O No problem with infertility **- please skip to question 7.3**
- O Yes

If YES:

7.2 In what year did you recognise you had infertility problems? ☐☐☐☐

7.3 Have you ever been pregnant or fathered a pregnancy (including miscarriages, ectopics or terminations)?

- O Yes
- O No **- please skip to Section Eight**

If YES:

7.4 Please answer the following questions for each of your pregnancies (if you have had more than 4 pregnancies, please phone the study team on 1800 232 904). For pregnancies involving twins, triplets or more, use a separate column for each baby.

		1st Pregnancy	2nd Pregnancy	3rd Pregnancy	4th Pregnancy
What was the outcome of this pregnancy?	Live birth	O	O	O	O
	Live birth but baby died within 28 days of birth	O	O	O	O
	Still birth	O	O	O	O
	Ectopic pregnancy	O	O	O	O
	Miscarriage	O	O	O	O
	Termination (abortion)	O	O	O	O
	Currently pregnant	O	O	O	O
Approximate date of pregnancy outcome		☐☐☐☐☐☐ d d m m y y	☐☐☐☐☐☐ d d m m y y	☐☐☐☐☐☐ d d m m y y	☐☐☐☐☐☐ d d m m y y
How many weeks was the pregnancy? (Full term = 40 wks)	Less than 20	O	O	O	O
	20 or more but less than 37	O	O	O	O
	37 or more (inc. full term)	O	O	O	O

Section Seven: Your Reproductive History

		1st Pregnancy	2nd Pregnancy	3rd Pregnancy	4th Pregnancy
If this pregnancy resulted in a birth, what was your baby's sex?	Male	O	O	O	O
	Female	O	O	O	O
	Not applicable	O	O	O	O
If this pregnancy resulted in a birth, what was your baby's birth weight?		lbs oz *or* g *or:* O Can't remember O Not applicable	lbs oz *or* g *or:* O Can't remember O Not applicable	lbs oz *or* g *or:* O Can't remember O Not applicable	lbs oz *or* g *or:* O Can't remember O Not applicable
Did the baby have any birth defects?	Yes	O	O	O	O
	No	O	O	O	O
	Not applicable	O	O	O	O
If this pregnancy resulted in a live birth, has the child ever suffered from cancer?	Yes	O	O	O	O
	No	O	O	O	O
	Not applicable	O	O	O	O

Section Eight: Recreation and Social Activities

Please answer the following questions regarding your recreation and social activities.

How often do you…

	EVERY DAY	SEVERAL TIMES PER WEEK	WEEKLY OR FORT-NIGHTLY	MONTHLY	RARELY OR ON SPECIAL OCCASIONS	NEVER
8.1 Have contact with an ex-service organisation?	O	O	O	O	O	O
8.2 Have social contact with other veterans?	O	O	O	O	O	O
8.3 Have contact with friends or relatives?	O	O	O	O	O	O
8.4 Attend social activities such as watching sport, eating meals or watching movies?	O	O	O	O	O	O
8.5 Play sport (e.g. golf, fishing, exercise)?	O	O	O	O	O	O
8.6 Set aside time to do a hobby (e.g. wood work, craft, music)?	O	O	O	O	O	O
8.7 Set aside time to relax (e.g. watch TV, read, listen to music)?	O	O	O	O	O	O
8.8 Do voluntary work?	O	O	O	O	O	O

8.9 Do you commemorate significant military-related occasions such as attend ANZAC Day services, participate in marches or attend dawn services?	O Yes	O No
8.10 Do you know of other service veterans living near you?	O Yes	O No
8.11 Are any of your close relatives (parents, siblings) military veterans?	O Yes	O No

Section Nine: Evaluation Questions

9.1 Are there other important health concerns we have not asked you about? O Yes O No

If **YES**: please give details in the space provided

9.2 Do you have any additional comments you would like to add? O Yes O No

If **YES**: please give details in the space provided

You are 2/3 of the way through. Keep going!

Part 3: Pre-deployment Personality and Resilience Insert

Section One: Personality

Here are a number of personality traits that may or may not apply to you. For each statement, shade the circle that indicates the extent to which you agree or disagree with that statement.

Rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

	DISAGREE			NEITHER AGREE NOR DISAGREE	AGREE		
	STRONGLY	MODERATELY	A LITTLE		A LITTLE	MODERATELY	STRONGLY
1.1 Extraverted, enthusiastic	○	○	○	○	○	○	○
1.2 Critical, quarrelsome	○	○	○	○	○	○	○
1.3 Dependable, self-disciplined	○	○	○	○	○	○	○
1.4 Anxious, easily upset	○	○	○	○	○	○	○
1.5 Open to new experiences, complex	○	○	○	○	○	○	○
1.6 Reserved, quiet	○	○	○	○	○	○	○
1.7 Sympathetic, warm	○	○	○	○	○	○	○
1.8 Disorganised, careless	○	○	○	○	○	○	○
1.9 Calm, emotionally stable	○	○	○	○	○	○	○
1.10 Conventional, uncreative	○	○	○	○	○	○	○

Section Two: Social Support

The next group of questions are about your relationships with people.

	OFTEN	SOMETIMES	RARELY	NEVER
2.1 How often do friends make you feel cared for?	O	O	O	O
2.2 How often do they express interest in how you are doing?	O	O	O	O
2.3 How often do friends make too many demands on you?	O	O	O	O
2.4 How often do they criticise you?	O	O	O	O
2.5 How often do friends create tensions or arguments with you?	O	O	O	O
	OFTEN	**SOMETIMES**	**RARELY**	**NEVER**
2.6 How often do family make you feel cared for?	O	O	O	O
2.7 How often do family express interest in how you are doing?	O	O	O	O
2.8 How often do they make too many demands on you?	O	O	O	O
2.9 How often do family criticise you?	O	O	O	O
2.10 How often do they create tensions or arguments with you?	O	O	O	O

Section Three and Four: Negative Life Events

For each of these next questions, shade the circle that best describes your response.

3. Overall, I had a happy childhood.

O Strongly disagree O Disagree O Neither agree nor disagree O Agree O Strongly agree

4. I have needed professional help to deal with emotional problems in the past.

O Not at all O To a small extent O To a moderate extent O To a large extent O Totally

Section Five: Symptom Interpretation

Listed below are conditions you may or may not have ever experienced. For each condition, please shade the circle next to each reason or group of reasons that corresponds to how much that might explain your condition. Please check every item for each question. Also, answer whether you have had the condition in the last 3 months by shading the 'Yes' or 'No' circle as appropriate.

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.1 If I had a prolonged headache, I would probably think that it is because:				
I am emotionally upset	○	○	○	○
There is something wrong with my muscles, nerves or brain	○	○	○	○
A loud noise, bright light or something else has irritated me	○	○	○	○
Have you had a prolonged headache in the last 3 months?		○ Yes	○ No	

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.2. If I was sweating a lot, I would probably think that it is because:				
I must have a fever or infection	○	○	○	○
I'm anxious or nervous	○	○	○	○
The room is too warm, I'm overdressed or working too hard	○	○	○	○
Have you noticed yourself sweating a lot in the last 3 months?		○ Yes	○ No	

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.3 If I got dizzy all of a sudden, I would probably think it is because:				
There is something wrong with my heart or blood pressure	○	○	○	○
I am not eating enough or I got up too quickly	○	○	○	○
I must be under alot of stress	○	○	○	○
Have you felt dizzy in the last 3 months?		○ Yes	○ No	

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.4 If I noticed my mouth was dry, I would probably think that is because:				
I must be scared or anxious about something	○	○	○	○
I need to drink more liquids	○	○	○	○
There is something wrong with my salivary glands	○	○	○	○
Have you had a dry mouth in the last 3 months?		○ Yes	○ No	

Section Five: Symptom Interpretation

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.5 If I felt my heart pounding in my chest, I would probably think that this is because:				
I've exerted myself or drunk a lot of coffee	O	O	O	O
I must be really excited or afraid	O	O	O	O
There must be something wrong with my heart	O	O	O	O
Have you noticed your heart pounding in the last 3 months?		O Yes	O No	

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.6 If I felt fatigued, I would probably think that it is because:				
I'm emotionally exhausted or discouraged	O	O	O	O
I've been over exerting myself or not exercising enough	O	O	O	O
I'm anaemic or my blood is weak	O	O	O	O
Have you felt fatigued in the last 3 months?		O Yes	O No	

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.7 If I noticed my hand trembling, I would probably think that it is because:				
I might have some sort of neurological problem	O	O	O	O
I'm very nervous	O	O	O	O
I've tired the muscle in my hand	O	O	O	O
Have you noticed your hands trembling in the last 3 months?		O Yes	O No	

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.8 If I had trouble sleeping, I would probably think that it is because:				
Some kind of pain or physical discomfort is keeping me awake	O	O	O	O
I'm not tired or I had too much coffee	O	O	O	O
I'm worrying too much or I must be nervous about something	O	O	O	O
Have you had trouble sleeping in the last 3 months?		O Yes	O No	

Section Five: Symptom Interpretation

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.9 If my stomach was upset, I would probably think that it is because:				
I've worried myself sick	O	O	O	O
I have the flu or stomach irritation	O	O	O	O
I've had something to eat that did not agree with me	O	O	O	O
Have you had an upset stomach in the last 3 months?		O Yes	O No	

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.10 If I lost my appetite, I would probably think that it is because:				
I've been eating too much or my body doesn't need as much food as before	O	O	O	O
I'm worrying so much that food just doesn't taste good anymore	O	O	O	O
I have some stomach or intestinal problem	O	O	O	O
Have you lost your appetite in the last 3 months?		O Yes	O No	

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.11 If I had a hard time catching my breath, I would probably think that it is because:				
My lungs are congested from infection, irritation or heart trouble	O	O	O	O
The room is stuffy or there is too much pollution in the air	O	O	O	O
I'm over excited or anxious	O	O	O	O
Have you had a hard time catching your breath in the last 3 months?		O Yes	O No	

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.12 If I noticed numbness or tingling in my hands or feet, I would probably think that it is because:				
I'm under emotional stress	O	O	O	O
There is something wrong with my nerves or blood circulation	O	O	O	O
I am cold or my hand or foot went to sleep	O	O	O	O
Have you had numbness or tingling in your hands or feet in the last 3 months?		O Yes	O No	

Section Five: Symptom Interpretation

	NOT AT ALL	SOME-WHAT	QUITE A BIT	A GREAT DEAL
5.13 If I was constipated or irregular, I would probably think that it is because:				
There is not enough fruit or fibre in my diet	O	O	O	O
Nervous tension is keeping me from being regular	O	O	O	O
There is something wrong with my bowels or intestine	O	O	O	O
Have you been constipated in the last 3 months?		O Yes	O No	

Section Six: Pre-existing Traumatic Exposures

Please indicate if you have ever in your lifetime experienced any of the following events:

	EXPERIENCED EVENT	NO. OF TIMES	AGE FIRST TIME	AGE LAST TIME
6.1 Direct combat	O No O Yes			
6.2 Life-threatening accident	O No O Yes			
6.3 Fire, flood, or other natural disaster	O No O Yes			
6.4 Witness someone badly injured or killed	O No O Yes			
6.5 Rape	O No O Yes			
6.6 Sexual molestation	O No O Yes			
6.7 Serious physical attack or assault	O No O Yes			
6.8 Threatened / harassed without weapon	O No O Yes			
6.9 Threatened with weapon / held captive / kidnapped	O No O Yes			
6.10 Tortured or victim of terrorists	O No O Yes			
6.11 Domestic violence	O No O Yes			
6.12 Witnessed domestic violence	O No O Yes			
6.13 Finding dead body	O No O Yes			
6.14 Witnessed someone suicide or attempt suicide	O No O Yes			
6.15 Child abuse - physical	O No O Yes			
6.16 Child abuse - emotional	O No O Yes			
6.17 Any other stressful event, please specify:	O No O Yes			
6.18 Did you ever suffer a great shock because one of these events happened to someone close to you? Please specify event type.	O No O Yes			


Draft

ID: | | | | | | | | |

Section Seven: Alexithymia

Using the scale provided as a guide, indicate how much you agree or disagree with each of the following statements by shading the corresponding circle. Give only one answer for each statement.

	STRONGLY DISAGREE	MODERATELY DISAGREE	NEITHER DISAGREE NOR AGREE	MODERATELY AGREE	STRONGLY AGREE
7.1 I am often confused about what emotion I am feeling.	○	○	○	○	○
7.2 It is difficult for me to find the right words for my feelings.	○	○	○	○	○
7.3 I have physical sensations that even doctors don't understand.	○	○	○	○	○
7.4 I am able to describe my feelings easily.	○	○	○	○	○
7.5 I prefer to analyse problems rather than just describe them.	○	○	○	○	○
7.6 When I am upset, I don't know if I am sad, frightened, or angry.	○	○	○	○	○
7.7 I am often puzzled by sensations in my body.	○	○	○	○	○
7.8 I prefer to just let things happen rather than to understand why they turned out that way.	○	○	○	○	○
7.9 I have feelings that I can't quite identify.	○	○	○	○	○
7.10 Being in touch with emotions is essential.	○	○	○	○	○
7.11 I find it hard to describe how I feel about people.	○	○	○	○	○
7.12 People tell me to describe my feelings more.	○	○	○	○	○
7.13 I don't know what's going on inside me.	○	○	○	○	○
7.14 I often don't know why I am angry.	○	○	○	○	○
7.15 I prefer talking to people about their daily activities rather than their feelings.	○	○	○	○	○
7.16 I prefer to watch "light" entertainment shows rather than psychological dramas.	○	○	○	○	○
7.17 It is difficult for me to reveal my innermost feelings, even to close friends.	○	○	○	○	○
7.18 I can feel close to someone, even in moments of silence.	○	○	○	○	○
7.19 I find examination of my feelings useful in solving personal problems.	○	○	○	○	○
7.20 Looking for hidden meanings in movies or plays distracts from their enjoyment.	○	○	○	○	○

9.3. MEAO Prospective study post-deployment questionnaire

CMVH
CENTRE FOR MILITARY & VETERANS' HEALTH

MilHOP
Military Health Outcomes Program

Middle East Area of Operations (MEAO)
Prospective Health Study
Post Deployment Questionnaire

Part 1: Post Deployment Health Questionnaire

Part 2: Deployment Experiences Questionnaire

For the purposes of this study, deployment to the Middle East Area of Operations includes:

- Deployment to Iraq or areas supporting operations in Iraq;
- Deployment to Afghanistan or areas supporting operations in Afghanistan.

For more information please refer to the instructions on the following page. If you are still uncertain regarding your eligibility to participate in this study, please contact the study team on 1800 232 904 or email cmvh@adelaide.org.au

Instructions to complete this questionnaire:

This questionnaire asks about your physical and mental health. All information you provide in this questionnaire will be de-identified and will not be linked to other data we have collected about your health without your consent.

Please complete all sections by following the instructions at the beginning of each question. Please **shade circles**, rather than ticking or crossing them, and write clearly and in **capital letters**.

Shade Circles Like This--> ●

Not Like This--> ⊗ ✓

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

If you make a mistake and wish to change your answer, simply cross out your mistake and choose the answer that is right for you.

Please use **blue or black pen**, not pencil.

Some questions may seem repetitive, but this is necessary due to the questions being grouped into scales.

If you have any questions, please call us on 1800 232 904.

SUPPORT

If you require support in regards to anything in this questionnaire, please refer to the contacts provided below:

ALL HOURS SUPPORT LINE (a confidential telephone triage support service for ADF members and their families)
1800 628 036; outside Australia +61 2 9425 3878

LIFELINE
13 11 14

VETERANS AND VETERANS' FAMILY COUNSELLING SERVICE
1800 011 046

VETERANS' AFFAIRS NETWORK (VAN)
1300 551 918; non-metro 1800 555 254

DEPARTMENT OF VETERANS' AFFAIRS
13 32 54

NATIONAL OFFICE FOR THE MILITARY COMPENSATION AND REHABILITATION SERVICE
1300 550 461

For questions, problems or concerns, or to have your name removed from the mailing list please contact:

THE STUDY TEAM. The Centre for Military and Veterans' Health
Freecall 1800 232 904; cmvh@adelaide.edu.au

FIRST CHIEF INVESTIGATOR. Professor Annette Dobson, University of Queensland
(07) 3365 5346; a.dobson@uq.edu.au

If you prefer to speak to an independent officer of the Universities or Defence Force not involved in the study, you may contact an ethics officer on the numbers listed below:

THE AUSTRALIAN DEFENCE HUMAN RESEARCH ETHICS COMMITTEE
Executive Secretary: (02) 6266 3837; ADHREC@defence.gov.au

THE UNIVERSITY OF ADELAIDE RESEARCH BRANCH
Secretary, Human Research Ethics Committee: (08) 8303 6028

THE DEPARTMENT OF VETERANS' AFFAIRS HUMAN RESEARCH ETHICS COMMITTEE
HREC Coordinator: (02) 6289 6204; ethics.committee@dva.gov.au

Part 1: Post-deployment Health Questionnaire

29221

ID:

Section One: Background Details

1.1 What is today's date? (dd/mm/yyyy) / /

1.2 Are you male or female? O Male O Female

1.3 What is your date of birth? (dd/mm/yyyy) / /

1.4 Are you currently in a significant intimate relationship?
O Yes - go to question 1.4a
O No - go to question 1.4b

1.4a Are you:
O Married and living together
O Married with unaccompanied spouse (i.e. married partner currently lives elsewhere)
O Living with partner (ADF recognised)
O Living with partner (not ADF recognised)
O In a long term relationship but not living together

1.4b Are you:
O Never married - go to question 1.8
O Previously married but now divorced - go to question 1.8
O Previously married but now separated - go to question 1.8
O Other, please specify: - go to question 1.8

1.5 Were you in a significant intimate relationship before the beginning of your last deployment to the MEAO?
O Yes - go to question 1.5a
O No - go to question 1.5b

1.5a Were you:
O Married and living together
O Married with unaccompanied spouse (i.e. married partner currently lives elsewhere)
O Living with partner (ADF recognised)
O Living with partner (not ADF recognised)
O In a long term relationship but not living together

1.5b Were you:
O Never married - go to question 1.8
O Previously married but now divorced - go to question 1.8
O Previously married but now separated - go to question 1.8
O Other, please specify: - go to question 1.8

1.6 How satisfied are you with your current marriage / relationship?
O Extremely satisfied
O Satisfied
O Neither satisfied or dissatisfied
O Dissatisfied
O Extremely dissatisfied
O Not applicable

1.7 Have you or your spouse / partner seriously suggested the idea of divorce or permanent separation since the beginning of your last deployment to the MEAO? O Yes O No O Not applicable

29221

ID:

Section One: Background Details

1.8 Overall, what impact have your military commitments (now, or in the past if you have left the military) had on your:

a) Marriage / relationship?
- O No impact
- O Positive impact
- O Negative impact
- O Not applicable

b) Children?
- O No impact
- O Positive impact
- O Negative impact
- O Not applicable

1.9 Which category best describes the highest educational qualification you have completed? Choose one
- O Primary school
- O Secondary school up to grade 10
- O Secondary school grades 11-12
- O Certificate (trade, apprenticeship, technicians etc)
- O Diploma (associate, undergraduate)
- O Bachelor degree
- O Post-graduate qualification

1.10 How many hours per week do you usually work, when you are not on deployment? ☐☐☐ hours

1.11 To the nearest year, how long have you served with the Australian Defence Force: (if more than 0, but less than 1 year, please enter 1)

a) As a regular? ☐☐ years or O Not applicable

b) As a reservist? ☐☐ years or O Not applicable

1.12 What is your CURRENT rank or what WAS your rank when you left the military?
- O Senior Commissioned Officer (CMDR / LTCOL / WGCDR and above)
- O Commissioned Officer (LCDR / MAJ / SQNLDR and below)
- O Senior Non-Commissioned Officer (PO / SGT and above)
- O Junior Non-Commissioned Officer (LS / CPL and below)
- O Other ranks (AB / SMN / PTE / LAC / AC or equivalent)

1.13 In the past THREE YEARS, roughly how many months in total have you been away on Operational deployment? (if more than 0, but less than 1 month, please enter 1) ☐☐ months

If you are still a member of the regular Australian Defence Force, please go to Section Two.

If you are a Reservist or have discharged from the regular Australian Defence Force, please complete the following questions.

29221

ID:

Section One: Background Details

1.14 What year did you discharge from the Regular Australian Defence Force?

or

O Not applicable, I am a Reservist

1.15 Did you discharge to the Reserves or out of the ADF completely? O Reserves O Out of ADF O Not applicable, I have always been a reservist

1.16 What is your current employment status?

O Paid employment full-time
O Paid employment part-time / casual
O Volunteer / community work
O Student
O Home Duties
O Retired
O Not working due to ill-health / TPI
O Unemployed
O Other, please specify:

1.17 Since you separated from the ADF, have you had a period of unemployment greater than 3 months? O Yes O No O Not applicable

If YES, was this period of unemployment primarily due to health problems? O Yes O No

If YES, please specify type

1.18 What is your main source of income now? Choose one.

O Wage or salary
O Own business or share in a partnership
O Age Service pension
O Invalidity Service Pension
O Compensation benefit under the VEA
O Compensation benefit under the SRCA
O Compensation benefit under the MRCA
O Other government pension / allowance / benefit
O Child allowance
O Superannuation / annuity
O Dividends / interest / income from investments
O Other, please specify:

29221

ID:

Section Two: Recent Health Symptoms

We would like to know about your health in the past month. Please indicate whether or not you have suffered any of the following symptoms in the past month, and if so, please indicate whether your symptoms were mild, moderate or severe in nature.

In the past month have you suffered from:	NO	YES		
2.1 Chest pain	O No	O Mild	O Moderate	O Severe
2.2 Headaches	O No	O Mild	O Moderate	O Severe
2.3 Rapid heartbeat	O No	O Mild	O Moderate	O Severe
2.4 Irritability / outbursts of anger	O No	O Mild	O Moderate	O Severe
2.5 Unable to breathe deeply enough	O No	O Mild	O Moderate	O Severe
2.6 Faster breathing than normal	O No	O Mild	O Moderate	O Severe
2.7 Feeling short of breath at rest	O No	O Mild	O Moderate	O Severe
2.8 Wheezing	O No	O Mild	O Moderate	O Severe
2.9 Sleeping difficulties	O No	O Mild	O Moderate	O Severe
2.10 Feeling jumpy / easily startled	O No	O Mild	O Moderate	O Severe
2.11 Feeling unrefreshed after sleep	O No	O Mild	O Moderate	O Severe
2.12 Fatigue	O No	O Mild	O Moderate	O Severe
2.13 Double vision	O No	O Mild	O Moderate	O Severe
2.14 Intolerance to alcohol	O No	O Mild	O Moderate	O Severe
2.15 Itchy or painful eyes	O No	O Mild	O Moderate	O Severe
2.16 Rash or skin irritation	O No	O Mild	O Moderate	O Severe
2.17 Skin infections e.g. boils	O No	O Mild	O Moderate	O Severe
2.18 Skin ulcers	O No	O Mild	O Moderate	O Severe
2.19 Shaking	O No	O Mild	O Moderate	O Severe
2.20 Tingling in fingers and arms	O No	O Mild	O Moderate	O Severe
2.21 Tingling in legs and toes	O No	O Mild	O Moderate	O Severe
2.22 Numbness in fingers / toes	O No	O Mild	O Moderate	O Severe
2.23 Feeling distant or cut off from others	O No	O Mild	O Moderate	O Severe
2.24 Constipation	O No	O Mild	O Moderate	O Severe
2.25 Flatulence or burping	O No	O Mild	O Moderate	O Severe

Section Two: Recent Health Symptoms

In the past month have you suffered from:	NO	YES		
2.26 Stomach cramps	O No	O Mild	O Moderate	O Severe
2.27 Diarrhoea	O No	O Mild	O Moderate	O Severe
2.28 Indigestion	O No	O Mild	O Moderate	O Severe
2.29 Dry mouth	O No	O Mild	O Moderate	O Severe
2.30 Pain in the face, jaw, in front of the ear, or in the ear	O No	O Mild	O Moderate	O Severe
2.31 Persistent cough	O No	O Mild	O Moderate	O Severe
2.32 Lump in throat	O No	O Mild	O Moderate	O Severe
2.33 Sore throat	O No	O Mild	O Moderate	O Severe
2.34 Forgetfulness	O No	O Mild	O Moderate	O Severe
2.35 Dizziness, fainting or blackouts	O No	O Mild	O Moderate	O Severe
2.36 Seizures or convulsions	O No	O Mild	O Moderate	O Severe
2.37 Feeling disorientated	O No	O Mild	O Moderate	O Severe
2.38 Loss of concentration	O No	O Mild	O Moderate	O Severe
2.39 Difficulty finding the right word	O No	O Mild	O Moderate	O Severe
2.40 Pain on passing urine	O No	O Mild	O Moderate	O Severe
2.41 Passing urine more often	O No	O Mild	O Moderate	O Severe
2.42 Burning sensation in the sex organs	O No	O Mild	O Moderate	O Severe
2.43 Loss of interest in sex	O No	O Mild	O Moderate	O Severe
2.44 Problems with sexual functioning	O No	O Mild	O Moderate	O Severe
2.45 Increased sensitivity to noise	O No	O Mild	O Moderate	O Severe
2.46 Increased sensitivity to light	O No	O Mild	O Moderate	O Severe
2.47 Increased sensitivity to smells or odours	O No	O Mild	O Moderate	O Severe
2.48 Ringing in the ears	O No	O Mild	O Moderate	O Severe
2.49 Avoiding doing things or situations	O No	O Mild	O Moderate	O Severe
2.50 Pain, without swelling or redness, in several joints	O No	O Mild	O Moderate	O Severe
2.51 Joint stiffness	O No	O Mild	O Moderate	O Severe
2.52 Feeling that your bowel movement is not finished	O No	O Mild	O Moderate	O Severe

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Section Two: Recent Health Symptoms

In the past month have you suffered from:	NO	YES		
2.53 Changeable bowel function (mixture of diarrhoea / constipation)	O No	O Mild	O Moderate	O Severe
2.54 General muscle aches or pains	O No	O Mild	O Moderate	O Severe
2.55 Loss of balance or coordination	O No	O Mild	O Moderate	O Severe
2.56 Difficulty speaking	O No	O Mild	O Moderate	O Severe
2.57 Low back pain	O No	O Mild	O Moderate	O Severe
2.58 Night sweats which soak the bed sheets	O No	O Mild	O Moderate	O Severe
2.59 Feeling feverish	O No	O Mild	O Moderate	O Severe
2.60 Tender or painful swelling of lymph glands in neck, armpit or groin	O No	O Mild	O Moderate	O Severe
2.61 Loss of, or decrease in, appetite	O No	O Mild	O Moderate	O Severe
2.62 Nausea	O No	O Mild	O Moderate	O Severe
2.63 Vomiting	O No	O Mild	O Moderate	O Severe
2.64 Distressing dreams	O No	O Mild	O Moderate	O Severe
2.65 Stomach bloating	O No	O Mild	O Moderate	O Severe
2.66 Unintended weight gain greater than 4kg	O No	O Mild	O Moderate	O Severe
2.67 Unintended weight loss greater than 4kg	O No	O Mild	O Moderate	O Severe

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Section Two: Recent Health Symptoms

2.68 Since the beginning of your last deployment, have you experienced any of the following events?		
Blast or Explosion IED (improvised explosive device)	O No	O Yes
RPG (rocket propelled grenade), Land Mine, Grenade, etc.	O No	O Yes
Vehicular accident / crash (any vehicle, including aircraft)	O No	O Yes
Fragment wound or bullet wound above the shoulders	O No	O Yes
Fall	O No	O Yes

If NO to all events in 2.68: please skip to question 3.1. Otherwise, continue.

2.69 How many times in total have you experienced each of the following symptoms immediately after any of the events listed above?	
Loss of consciousness / "knocked out"	☐☐ times
Being dazed, confused, or "seeing stars"	☐☐ times
Not remembering the event	☐☐ times
Concussion	☐☐ times
Head injury	☐☐ times

2.70 Did any of the following problems begin or get worse after any of the events listed above?					
Memory problems or lapses	O No	O Yes	Irritability	O No	O Yes
Balance problems or dizziness	O No	O Yes	Headaches	O No	O Yes
Sensitivity to bright light	O No	O Yes	Sleep problems	O No	O Yes

2.71 In the past week, have you had any of these symptoms?					
Memory problems or lapses	O No	O Yes	Irritability	O No	O Yes
Balance problems or dizziness	O No	O Yes	Headaches	O No	O Yes
Sensitivity to bright light	O No	O Yes	Sleep problems	O No	O Yes

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Section Three: Your Health Now

This next set of questions ask for your views about your health. This information will help you to keep track of how you feel and how well you are able to do your usual activities.

For each of the following questions, please shade the circle that best describes your answer.

3.1 In general, how would you say your health is? O Excellent O Very good O Good O Fair O Poor

3.2 The following questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf?	O Yes, limited a lot	O Yes, limited a little	O No, not limited at all
Climbing several flights of stairs?	O Yes, limited a lot	O Yes, limited a little	O No, not limited at all

3.3 During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	ALL OF THE TIME	MOST OF THE TIME	SOME OF THE TIME	A LITTLE OF THE TIME	NONE OF THE TIME
Accomplished less than you would like	O	O	O	O	O
Were limited in the kind of work or other activities	O	O	O	O	O

3.4 During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

	ALL OF THE TIME	MOST OF THE TIME	SOME OF THE TIME	A LITTLE OF THE TIME	NONE OF THE TIME
Accomplished less than you would like	O	O	O	O	O
Did work or other activities less carefully than usual	O	O	O	O	O

3.5 During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

O Not at all O A little bit O Moderately O Quite a bit O Extremely

3.6 These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks

	ALL OF THE TIME	MOST OF THE TIME	SOME OF THE TIME	A LITTLE OF THE TIME	NONE OF THE TIME
Have you felt calm and peaceful?	O	O	O	O	O
Did you have a lot of energy?	O	O	O	O	O
Have you felt downhearted and depressed?	O	O	O	O	O

3.7 During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives etc.)?

O All of the time O Most of the time O Some of the time O A little of the time O None of the time

Section Three: Your Health Now

In general, how would you rate your	EXCELL-ENT	VERY GOOD	GOOD	FAIR	POOR
3.8 Overall health?	O	O	O	O	O
3.9 Quality of life?	O	O	O	O	O
3.10 Eyesight (with glasses or contact lenses, if you wear them)?	O	O	O	O	O
3.11 Hearing?	O	O	O	O	O
3.12 Memory?	O	O	O	O	O
3.13 Teeth and gums?	O	O	O	O	O

The following questions inquire about how you have been feeling over the last four (4) weeks. Please read each question carefully and then indicate, by shading the circle, the response that best describes how you have been feeling.	ALL OF THE TIME	MOST OF THE TIME	SOME OF THE TIME	A LITTLE OF THE TIME	NONE OF THE TIME
3.14 In the past four (4) weeks, about how often did you feel tired for no good reason?	O	O	O	O	O
3.15 In the past four (4) weeks, about how often did you feel nervous?	O	O	O	O	O
3.16 In the past four (4) weeks, about how often did you feel so nervous that nothing could calm you down?	O	O	O	O	O
3.17 In the past four (4) weeks, about how often did you feel hopeless?	O	O	O	O	O
3.18 In the past four (4) weeks, about how often did you feel restless or fidgety?	O	O	O	O	O
3.19 In the past four (4) weeks, about how often did you feel so restless that you could not sit still?	O	O	O	O	O
3.20 In the past four (4) weeks, about how often did you feel depressed?	O	O	O	O	O
3.21 In the past four (4) weeks, about how often did you feel that everything was an effort?	O	O	O	O	O
3.22 In the past four (4) weeks, about how often did you feel so sad that nothing could cheer you up?	O	O	O	O	O
3.23 In the past four (4) weeks, about how often did you feel worthless?	O	O	O	O	O

Section Three: Your Health Now

The next few questions are about how these feelings may have affected you in the past four (4) weeks. You need not answer these questions if you answered 'None of the time' to all of the previous ten questions about your feelings.

3.24 In the past four (4) weeks, how many days were you TOTALLY UNABLE to work, study or manage your day to day activities because of these feelings? ☐☐ days

3.25 [Aside from those days], in the past four (4) weeks, HOW MANY DAYS were you able to work or study or manage your day to day activities, but had to CUT DOWN on what you did because of these feelings? ☐☐ days

3.26 In the past four (4) weeks, how many times have you seen a doctor or any other health professional about these feelings? ☐☐ times

3.27 In the past four (4) weeks, how often have physical health problems been the main cause of these feelings?

O None of the time O A little of the time O Some of the time O Most of the time O All of the time

3.28 Please rate the following statements based on how you have felt in the past 30 days using the scale below

	NOT TRUE AT ALL	RARELY TRUE	SOME-TIMES TRUE	OFTEN TRUE	TRUE NEARLY ALL THE TIME
a) I am able to adapt to change	O	O	O	O	O
b) I tend to bounce back after illness or hardship	O	O	O	O	O

Section Three: Your Health Now

Since returning from your last MEAO deployment, has a medical doctor diagnosed you with, or treated you for any of the following medical problems or conditions?

	YES	NO
3.29 High blood pressure	O	O
3.30 Migraines	O	O
3.31 Bowel disorder e.g. diarrhoea, constipation, bleeding	O	O
3.32 Eye or vision problems e.g. glaucoma	O	O
3.33 Hearing loss	O	O
3.34 Malaria	O	O
3.35 Any other significant infections, please specify type:	O	O
3.36 Arthritis or rheumatism	O	O
3.37 Back or neck problems	O	O
3.38 Joint problems	O	O
3.39 Asthma	O	O
3.40 Bronchitis	O	O
3.41 Sinus problems	O	O
3.42 Hay fever	O	O
3.43 Ear infection	O	O
3.44 Dermatitis	O	O
3.45 Any other skin problem, please specify type:	O	O
3.46 Skin cancer e.g. squamous cell or basal cell skin cancers	O	O
3.47 Any other kind of cancer, tumour or malignancy, please specify type:	O	O
3.48 Anxiety, stress or depression	O	O
3.49 Post traumatic stress disorder	O	O

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Section Three: Your Health Now

	YES	NO
3.50 Other psychiatric or psychological condition needing treatment or counselling, please specify type:	O	O
3.51 Any other medical condition, please specify type:	O	O

Section Four: Lifestyle Behaviours

4.1 Since the beginning of your last deployment to the MEAO, have you used any of the following tobacco products?

	NO	YES
a. Cigarettes	O	O
b. Cigars	O	O
c. Pipes	O	O
d. Smokeless tobacco (e.g. chew, dip, snuff)	O	O

4.2 In your lifetime, have you smoked at least 100 cigarettes (5 packs)?

O No - **please skip to question 4.9**

O Yes - **continue to next question**

4.3 At what age did you start smoking? ☐☐ years old

4.4 How many years have you, or did you, smoke an average of at least 3 cigarettes per day (or one pack per week)? ☐☐ years

4.5 When smoking, how many packs (25 cigarettes) per day did you, or do you, smoke?

O Less than half a pack per day
O Half to 1 pack per day
O 1 to 2 packs per day
O More than 2 packs per day

4.6 Have you ever tried to quit smoking?

O Yes, and succeeded
O Yes, but not successfully
O No

4.7 Was your smoking pattern different while on your last deployment to the MEAO?

O I did not smoke on deployment
O I smoked less than usual while on deployment
O I smoked the same amount on deployment as when not deployed
O I smoked more than usual while on deployment
O I began / restarted smoking on deployment

4.8 If your smoking pattern changed during your deployment, what was the main reason?

Section Four: Lifestyle Behaviours

4.9. How often do you have a drink containing alcohol?	Never	Monthly or Less	2 to 4 times a month	2 to 3 times a week	4 or more times a week
	O	O	O	O	O

In answering the following questions, please remember that a standard drink contains 10g of pure alcohol

4.10 How many 'standard' drinks (see above) containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more	N/A
	O	O	O	O	O	O

	NEVER	LESS THAN MONTHLY	MONTHLY	WEEKLY	DAILY OR ALMOST DAILY
4.11 How often do you have six or more drinks on one occasion?	O	O	O	O	O
4.12 How often since the beginning of your last deployment have you found that you were not able to stop drinking once you had started?	O	O	O	O	O
4.13 How often since the beginning of your last deployment have you failed to do what was normally expected from you because of drinking?	O	O	O	O	O

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Section Four: Lifestyle Behaviours

	NEVER	LESS THAN ONCE A MONTH	MONTHLY	WEEKLY	DAILY OR ALMOST DAILY
4.14 How often since the beginning of your last deployment have you needed a drink in the morning to get yourself going after a heavy drinking session?	O	O	O	O	O
4.15 How often since the beginning of your last deployment have you had a feeling of guilt or remorse after drinking?	O	O	O	O	O
4.16 How often since the beginning of your last deployment have you been unable to remember what happened the night before because you had been drinking?	O	O	O	O	O

4.17 Have you or someone else been injured as a result of your drinking?	No O	Yes, but not since the beginning of my last deployment O	Yes, since the beginning of my last deployment O
4.18 Has a relative, a friend, a doctor or other health professional been concerned about your drinking or suggested you cut down?	No O	Yes, but not since the beginning of my last deployment O	Yes, since the beginning of my last deployment O

4.19 Do you presently have a problem with drinking?	No O	Probably not O	Unsure O	Possibly O	Definitely O

4.20 In the next 3 months, how difficult would you find it to cut down or stop drinking?	Very easy O	Fairly easy O	Neither difficult nor easy O	Fairly difficult O	Very difficult O	N/A O

4.21 On an average day, how many 250 - 375ml beverages containing caffeine do you drink (such as caffeine containing energy drinks, coffee, tea, coca-cola)?

O None O 1-2 per day O 3-5 per day O 6-10 per day O 11 or more per day

Section Four: Lifestyle Behaviours

4.22 Do you currently take any of the following supplements?

a) Body building supplements (such as amino acids, weight gain products, creatine, etc.)

O Never O Less than once a month O Monthly O Weekly O Daily or almost daily

If YES, what was the name (generic or brand name) of the supplement(s) that you used?

b) Energy supplements (such as energy drinks, pills, or energy enhancing herbs)

O Never O Less than once a month O Monthly O Weekly O Daily or almost daily

If YES, what was the name (generic or brand name) of the supplement(s) that you used?

c) Weight loss supplements

O Never O Less than once a month O Monthly O Weekly O Daily or almost daily

If YES, what was the name (generic or brand name) of the supplement(s) that you used?

Since the beginning of your last deployment...

	NEVER	SOMETIMES	MOST OF THE TIME	ALMOST ALWAYS
4.23 Have you bet more than you could really afford to lose?	O	O	O	O
4.24 Have you needed to gamble with larger amounts of money to get the same feeling of excitement?	O	O	O	O
4.25 When you gambled, did you go back another day to try to win back the money you lost?	O	O	O	O
4.26 Have you borrowed money or sold anything to get money to gamble?	O	O	O	O
4.27 Have you felt that you might have a problem with gambling?	O	O	O	O
4.28 Has gambling caused you any health problems, including stress or anxiety?	O	O	O	O
4.29 Have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?	O	O	O	O
4.30 Has your gambling caused any financial problems for you or your household?	O	O	O	O
4.31 Have you felt guilty about the way you gamble or what happens when you gamble?	O	O	O	O

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Section Five: Life Experiences

Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please read each one carefully, then shade the circle to the right to indicate how much you have been bothered by that problem in the past month.

	NOT AT ALL	A LITTLE BIT	MODERA-TELY	QUITE A BIT	EXTREM-ELY
5.1 Repeated, disturbing memories, thoughts or images of a stressful experience from the past?	O	O	O	O	O
5.2 Repeated, disturbing dreams of a stressful experience from the past?	O	O	O	O	O
5.3 Suddenly acting or feeling as if a stressful experience from the past were happening again (as if you were reliving it)?	O	O	O	O	O
5.4 Feeling very upset when something reminded you of a stressful experience from the past?	O	O	O	O	O
5.5 Having physical reactions (e.g. heart pounding, trouble breathing, sweating) when something reminded you of a stressful experience from the past?	O	O	O	O	O
5.6 Avoiding thinking about or talking about a stressful experience from the past or avoiding having feelings related to it?	O	O	O	O	O
5.7 Avoiding activities or situations because they reminded you of a stressful experience from the past?	O	O	O	O	O
5.8 Trouble remembering important parts of a stressful experience from the past?	O	O	O	O	O
5.9 Loss of interest in activities that you used to enjoy?	O	O	O	O	O
5.10 Feeling distant or cut off from other people?	O	O	O	O	O
5.11 Feeling emotionally numb or being unable to have loving feelings for those close to you?	O	O	O	O	O
5.12 Feeling as if your future somehow will be cut short?	O	O	O	O	O
5.13 Trouble falling or staying asleep?	O	O	O	O	O
5.14 Feeling irritable or having angry outbursts?	O	O	O	O	O
5.15 Having difficulty concentrating?	O	O	O	O	O
5.16 Being "superalert" or watchful or on guard?	O	O	O	O	O
5.17 Feeling jumpy or easily startled?	O	O	O	O	O

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Section Five: Life Experiences

Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please read each one carefully, then shade the circle to the right to indicate how much you have been bothered by that problem in the past month.

	NOT AT ALL	A LITTLE BIT	MODERA-TELY	QUITE A BIT	EXTREM-ELY
5.17a Having strong negative beliefs about yourself, other people, or the world (for example, having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?	O	O	O	O	O
5.17b Blaming yourself or someone else severely for the stressful experience or what happened after it?	O	O	O	O	O
5.17c Having strong negative feelings such as fear, horror, anger, guilt, or shame?	O	O	O	O	O
5.17d Taking too many risks or doing things that cause you harm?	O	O	O	O	O

5.18 Thinking of the event(s) that you used to answer questions 5.1 - 5.17d, please list these events and the years they occurred below.

	Event description	Year
1		
2		
3		

5.19 Did any of these occur while on your deployment to the MEAO? O Yes O No

5.20 Did any of these occur during another overseas deployment? O Yes O No

5.21 Is there any other event that has caused you to have similar reactions?
O No
O Yes - while deployed
O Yes - while NOT deployed

If yes, what was that event?

Year of event

Section Five: Life Experiences

5.22 Thinking over the past 4 weeks, shade the circle that best describes the amount of time you felt that way.

	NONE OF THE TIME	A LITTLE OF THE TIME	SOME OF THE TIME	MOST OF THE TIME	ALL OF THE TIME
a) I found myself getting angry at people or situations	O	O	O	O	O
b) When I got angry, I got really mad	O	O	O	O	O
c) When I got angry, I stayed angry	O	O	O	O	O
d) When I got angry at someone, I wanted to hit them	O	O	O	O	O
e) My anger interfered with my ability to get my work, study or other productive activity done	O	O	O	O	O
f) My anger prevented me from getting along with people as well as I'd have liked to	O	O	O	O	O
g) I became angry at myself when I did not perform as well or achieve what I wanted	O	O	O	O	O
h) I became angry at myself when I did not handle social situations as well as I wanted	O	O	O	O	O
i) My anger had a bad effect on my health	O	O	O	O	O

5.23 How often over the last month did you get into a fight with someone and hit the person?

O Never O One time O Two times O Three or four times O Five or more times

5.24 How often over the last month did you threaten someone with physical violence?

O Never O One time O Two times O Three or four times O Five or more times

Section Five: Life Experiences

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 EVERY DAY
5.25 Little interest or pleasure in doing things	O	O	O	O
5.26 Feeling down, depressed, or hopeless	O	O	O	O
5.27 Trouble falling or staying asleep, or sleeping too much	O	O	O	O
5.28 Feeling tired or having little energy	O	O	O	O
5.29 Poor appetite or overeating	O	O	O	O
5.30 Feeling bad about yourself, or that you are a failure, or have let yourself or your family down	O	O	O	O
5.31 Trouble concentrating on things, such as reading the newspaper or watching television	O	O	O	O
5.32 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	O	O	O	O
5.33 Thoughts that you would be better off dead or of hurting yourself in some way	O	O	O	O

5.34 If you checked off any of these problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

O Not difficult at all O Somewhat difficult O Very difficult O Extremely difficult

The next group of questions are about anxiety.

	NO	YES
5.35 In the last 4 weeks, have you had an anxiety attack - suddenly feeling fear or panic?	O	O
If NO: please skip to question 5.50		
5.36 Has this ever happened before?	O	O
5.37 Do some of these attacks come suddenly out of the blue - that is, in situations where you don't expect to be nervous or uncomfortable?	O	O
5.38 Do these attacks bother you a lot or are you worried about having another attack?	O	O

Section Five: Life Experiences

Think about your last bad anxiety attack.	NO	YES
5.39 Were you short of breath?	O	O
5.40 Did your heart race, pound, or skip?	O	O
5.41 Did you have chest pain or pressure?	O	O
5.42 Did you sweat?	O	O
5.43 Did you feel as if you were choking?	O	O
5.44 Did you have hot flushes or chills?	O	O
5.45 Did you have nausea or an upset stomach, or the feeling that you were going to have diarrhoea?	O	O
5.46 Did you feel dizzy, unsteady, or faint?	O	O
5.47 Did you have tingling or numbness in parts of your body?	O	O
5.48 Did you tremble or shake?	O	O
5.49 Were you afraid you were dying?	O	O

Over the last 4 weeks, how often have you been bothered by any of the following problems?	NOT AT ALL	SEVERAL DAYS	MORE THAN HALF THE DAYS
5.50 Feeling nervous, anxious, on edge, or worrying a lot about different things	O	O	O
If NOT AT ALL: please skip to question 5.57			
5.51 Feeling restless so that it is hard to sit still	O	O	O
5.52 Getting tired very easily	O	O	O
5.53 Muscle tension, aches, or soreness	O	O	O
5.54 Trouble falling asleep or staying asleep	O	O	O
5.55 Trouble concentrating on things, such as reading a book or watching TV	O	O	O
5.56 Becoming easily annoyed or irritable	O	O	O

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Section Five: Life Experiences

Please shade the circles that best describe your experience.		
5.57 Since the beginning of your last deployment, have you ever felt that life was not worth living?	O No	O Yes
5.58 Since the beginning of your last deployment, have you ever felt so low that you thought about committing suicide?	O No	O Yes
5.59 Since the beginning of your last deployment, have you made a suicide plan?	O No	O Yes
5.60 Since the beginning of your last deployment, have you attempted suicide?	O No	O Yes

If you require support in relation to any issues you have identified in this survey, we encourage you to refer to the contacts provided on Page 3

5.61 Have you sought help for a stress, emotional, mental health or family problem in the last 12 months?	O No	O Yes

Using the scale provided, rate each of the possible reasons that might affect your decision to receive mental health counselling or services if you ever had a problem:

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
5.62 It would be too embarrassing.	O	O	O	O	O
5.63 It would harm my career.	O	O	O	O	O
5.64 Members of my unit might have less confidence in me.	O	O	O	O	O
5.65 My unit leadership might treat me differently.	O	O	O	O	O
5.66 My leaders would blame me for the problem.	O	O	O	O	O
5.67 I would be seen as weak.	O	O	O	O	O
5.68 I don't trust mental health professionals.	O	O	O	O	O
5.69 I don't know where to get help.	O	O	O	O	O
5.70 I do not have confidence in military health, administrative, or social services.	O	O	O	O	O
5.71 It would stop me from being deployed again.	O	O	O	O	O
5.72 It is difficult to schedule an appointment.	O	O	O	O	O
5.73 There would be difficulty getting time off work for treatment.	O	O	O	O	O
5.74 I would want to deal with the problems on my own.	O	O	O	O	O

Section Six: Your Respiratory Health

The following questions ask you about any respiratory symptoms you may have experienced since the beginning of your last deployment.		
	NO	**YES**
6.1 Have you had wheezing or whistling in your chest at any time since the beginning of your last deployment?	O	O
If YES:		
a. Have you been at all breathless when the wheezing noise was present?	O	O
b. Have you had this wheezing or whistling when you did not have a cold?	O	O
6.2 Have you woken up with a feeling of tightness in your chest at any time since the beginning of your last deployment?	O	O
6.3 Have you been woken by an attack of shortness of breath at any time since the beginning of your last deployment?	O	O
6.4 Have you been woken by an attack of coughing at any time since the beginning of your last deployment?	O	O
6.5 Have you had an attack of asthma since the beginning of your last deployment?	O	O
6.6 Are you currently taking any medicine for asthma (including inhalers, aerosols, or tablets)?	O	O
6.7 Do you have any nasal allergies including hay fever?	O	O

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Section Seven: Recreation and Social Activities

Please answer the following questions regarding your recreation and social activities. How often do you...

	EVERY DAY	SEVERAL TIMES PER WEEK	WEEKLY OR FORT-NIGHTLY	MONTHLY	RARELY OR ON SPECIAL OCCASIONS	NEVER
7.1 Have contact with an ex-service organisation?	O	O	O	O	O	O
7.2 Have social contact with other veterans?	O	O	O	O	O	O
7.3 Have contact with friends or relatives?	O	O	O	O	O	O
7.4 Attend social activities such as watching sport, eating meals or watching movies?	O	O	O	O	O	O
7.5 Play sport (e.g. golf, fishing, exercise)?	O	O	O	O	O	O
7.6 Set aside time to do a hobby (e.g. wood work, craft, music)?	O	O	O	O	O	O
7.7 Set aside time to relax (e.g. watch TV, read, listen to music)?	O	O	O	O	O	O
7.8 Do voluntary work?	O	O	O	O	O	O

7.9 Do you commemorate significant military-related occasions such as attend ANZAC Day services, participate in marches or attend dawn services?	O Yes	O No
7.10 Do you know of other service veterans living near you?	O Yes	O No

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Section Eight: Evaluation Questions

8.1 Are there other important health concerns we have not asked you about? O Yes O No

If **YES**, please give details in the space provided

8.2 Do you have any additional comments you would like to add? O Yes O No

If **YES**, please give details in the space provided

You are 2/3 of the way through. Keep going!

Part 2:
Deployment Questionnaire

Instructions to complete:

Please answer these questions in relation to your LAST deployment to the Middle East Area of Operations.

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Section One: Deployment Details

1.1 On your MOST RECENT deployment to the MEAO, were you mainly based in: (please shade all that apply)

- O Tarin Kowt
- O Kandahar
- O Kabul
- O Other areas in Afghanistan
- O Other areas supporting Afghanistan
- O Iraq
- O Other areas supporting Iraq
- O Attachment to foreign militaries or UN

1.2 How many weeks lead time were you given prior to your last deployment to the MEAO? (if more than 0, but less than 1 week, please enter 1) ☐☐ weeks

1.3 During your last deployment to the MEAO, what were your MAIN duties? (please shade all that apply)

- O Combat (e.g. Infantry, Artillery, etc.)
- O Medical (e.g. RMO, Environmental or Preventive Health, Nurses, Medics)
- O Security
- O EOD (Bomb Disposal, IED Technician)
- O Training Local Police / Army
- O Engineering
- O Logistics / Supply
- O Force Protection
- O Driver
- O Welfare (e.g. Chaplain, Psychologist)
- O Trades (e.g. Fitter, Mechanic)
- O Air Crew - Rotary Wing
- O Air Crew - Fixed Wing
- O Flight Operations Cell
- O Oil Platform Protection
- O Maritime Operations - Between Deck
- O Maritime Operations - Above Deck
- O Clearance Diver
- O Boarding Party
- O Administrative
- O Headquarters
- O CIMIC (Civil Military Co-operation)
- O Peacekeeping
- O Catering
- O Intelligence
- O Communications
- O Military Police
- O Other, please specify

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

1.4 Were you required to work mixed duty cycles (ie. day - night - day shifts)? O Often O Sometimes O Rarely O Never

1.5 Were you permanently on night shifts during your last deployment to the MEAO? O Yes O No

1.6 About how many hours per day, on average, were you considered 'on duty'? ☐☐ hours

1.7 How many days per month did you not work on your last deployment to the MEAO? (if more than 0, but less than 1 day, please enter 1) ☐☐ days per month

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Section One: Deployment Details

1.8 What was your rank during your last deployment to the MEAO?

- O Senior Commissioned Officer (CMDR / LTCOL / WGCDR and above)
- O Commissioned Officer (LCDR / MAJ / SQNLDR and below)
- O Senior Non-Commissioned Officer (PO / SGT and above)
- O Junior Non-Commissioned Officer (LS / CPL and below)
- O Other ranks (AB / SMN / PTE / LAC / AC or equivalent)

1.9 Please indicate your service status during your last deployment to the MEAO.

O Reservist on full time service O Full time member O Other, please specify

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Section Two: Chemical and Environmental Exposures

During your last deployment to the MEAO, how often...?	NEVER	ONCE	2-4 TIMES	5-9 TIMES	10+ TIMES
2.1 Were you exposed to smoke from fires / smoke from waste incineration / oil fire smoke?	O	O	O	O	O
2.2 Were you exposed to dust storms?	O	O	O	O	O
2.3 Were you exposed to an environment where you inhaled fine dust or fibres (e.g. driving vehicles, near operating aircraft, damaged building)?	O	O	O	O	O
2.4 Were you exposed to others' cigarette smoke in an enclosed recreational or work environment?	O	O	O	O	O
2.5 Were you exposed to diesel exhaust?	O	O	O	O	O
2.6 Were you exposed to aviation, marine or automotive fuels?	O	O	O	O	O
2.7 Were you exposed to aircraft fumes?	O	O	O	O	O
2.8 Were you exposed to toxic industrial chemicals?	O	O	O	O	O
2.9 Were you exposed to solvents (e.g. thinners, sealer, paints)?	O	O	O	O	O
2.10 Did you live in an area recently sprayed or fogged with chemicals?	O	O	O	O	O
2.11 Did you dip your cams to prevent insect bites?	O	O	O	O	O
2.12 Did you take medication to prevent or suppress malaria (e.g. Doxycycline, Primaquine)?	O	O	O	O	O
2.13 Were you close to loud noises and did not have hearing protection (e.g. explosions, weapon fire)?	O	O	O	O	O
2.14 Were you exposed to noise for extended periods of time without hearing protection (e.g. machinery, aircraft operations)?	O	O	O	O	O
2.15 Were you bitten by flies, sand flies, fleas, mosquitoes or other insects that required medical attention?	O	O	O	O	O
2.16 Did you have close contact with local animals (dogs, cats, rats, etc.)?	O	O	O	O	O
2.17 Did you come into contact with body fluids or blood?	O	O	O	O	O
2.18 Did you receive a blood transfusion?	O	O	O	O	O
2.19 Did you drink from local taps or wells?	O	O	O	O	O
2.20 Did you eat local food?	O	O	O	O	O
2.21 Did the food available have a negative effect on your performance?	O	O	O	O	O

Section Two: Chemical and Environmental Exposures

During your last deployment to the MEAO, how often...?

	NEVER	ONCE	2-4 TIMES	5-9 TIMES	10+
2.22 Did you swim or bath in local lakes, rivers or the sea?	O	O	O	O	O
2.23 Did you have contact with the local population?	O	O	O	O	O
2.24 Did you get sunburnt?	O	O	O	O	O
2.25 Were you close to sources of non-ionising radiation (e.g. radar or microwave, or EOD countermeasures)?	O	O	O	O	O
2.26 Did you have contact with any chemical or biological weapons?	O	O	O	O	O
2.27 Did you have contact with depleted uranium shell casings?	O	O	O	O	O
2.28 Did you enter or come in close proximity to recently destroyed vehicles?	O	O	O	O	O
2.29 Did you enter or come in close proximity to recently destroyed structures (e.g. buildings, bunkers, etc.)?	O	O	O	O	O
2.30 Were you exposed to ionising radiation or radioactive material?	O	O	O	O	O
2.31 Did you use an NBC suit (not for training purposes)?	O	O	O	O	O
2.32 Did you use a respirator (not for training purposes)?	O	O	O	O	O
2.33 Did you clear / search buildings?	O	O	O	O	O
2.34 Did you clear / search caves?	O	O	O	O	O
2.35 Did you come under small arms or anti-aircraft fire?	O	O	O	O	O
2.36 Did you come under guided or directed mortar / artillery fire or missile attack?	O	O	O	O	O
2.37 Did you experience in-direct fire (e.g. rocket attack)?	O	O	O	O	O
2.38 Did you seriously fear you would encounter an IED?	O	O	O	O	O
2.39 Did you experience an IED / EOD that detonated?	O	O	O	O	O
2.40 Did you experience a suicide bombing?	O	O	O	O	O
2.41 Did you experience a landmine strike?	O	O	O	O	O
2.42 Did you encounter small arms fire from an unknown enemy combatant (e.g. sniper, civilian with weapon)?	O	O	O	O	O
2.43 Did you discharge your weapon in direct combat?	O	O	O	O	O

Section Two: Chemical and Environmental Exposures

During your last deployment to the MEAO, how often...?	NEVER	ONCE	2-4 TIMES	5-9 TIMES	10+
2.44 Did you experience a threatening situation where you were unable to respond due to the rules of engagement?	O	O	O	O	O
2.45 Did you go on combat patrols or missions?	O	O	O	O	O
2.46 Did you participate in support convoys (eg. re-supply, VIP escort)?	O	O	O	O	O
2.47 Were you concerned about yourself or others (including allies) having an unauthorised discharge of a weapon?	O	O	O	O	O
2.48 Were you in danger of being killed? e.g. combat, motor vehicle accident (MVA), assault, hostage situation	O	O	O	O	O
2.49 Were you in danger of being injured? e.g. combat, MVA, assault, hostage situation	O	O	O	O	O
2.50 Did you handle dead bodies? e.g. combat, civilian casualties	O	O	O	O	O
2.51 Did you see dead bodies? e.g. combat, civilian casualties	O	O	O	O	O
2.52 Did you hear of a close friend or co-worker who had been injured or killed? e.g. combat, MVA, disaster situation	O	O	O	O	O
2.53 Were you present when a close friend or co-worker was injured or killed? e.g. combat, MVA, disaster situation	O	O	O	O	O
2.54 Did you fear that you had been exposed to a contagious disease, toxic agent or injury? e.g. radioactivity, HIV, chemical warfare	O	O	O	O	O
2.55 Were you witness to human degradation and misery on a large scale? e.g. refugee camps, starvation	O	O	O	O	O
2.56 Did you hear of a loved one who had been injured or killed?	O	O	O	O	O
2.57 Were you present when a loved one was injured or killed?	O	O	O	O	O
2.58 Do you believe your action or inaction resulted in someone being seriously injured? e.g. in combat or as a result of rules of engagement or UN restrictions not allowing you to act	O	O	O	O	O
2.59 Do you believe your actions or inaction resulted in someone being killed? e.g. in combat or as a result of rules of engagement or UN restrictions not allowing you to act	O	O	O	O	O

Section Two: Chemical and Environmental Exposures

2.60 During your last deployment to the MEAO, for how long were you outside your base in a hostile area in total?

- O Not at all
- O Up to one week
- O Up to one month
- O More than a month

2.61 Are there any additional experiences you would like to tell us about? Please comment

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Section Three: Your Work on Deployment

3.1 Did you feel that the work asked of you in theatre generally matched your trade experiences and ability?

- O Yes
- O No, work was generally above my trade experience and ability
- O No, work was generally beneath my trade experience and ability

3.2 Thinking of one very difficult experience on this deployment, do you feel that:

a) Your colleagues did what was expected of them?	O Yes	O No
b) You did what was expected of you?	O Yes	O No

The following statements relate to the equipment you were provided with while on your last deployment to the MEAO. Please indicate the degree to which you either agree or disagree with each statement.

	STRONGLY DISAGREE	SOMEWHAT DISAGREE	NEITHER AGREE NOR DISAGREE	SOMEWHAT AGREE	STRONGLY AGREE
3.3 I experienced pain or injury from using the equipment provided to me	O	O	O	O	O
3.4 I felt that I had adequate practical experience using my equipment	O	O	O	O	O
3.5 I had all the supplies and equipment needed to get my job done	O	O	O	O	O

3.6 If you agree with any of the above 3 questions, please give examples:

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Section Three: Your Work on Deployment

3.7 The following questions ask about your work during your last deployment to the MEAO. Please answer how often you performed these duties during your deployment, and if you did perform the duty, whether you think this benefited the local community.

	NEVER	OCCAS-IONALLLY	FREQ-UENTLY	IF OCCASIONALLY OR FREQUENTLY, DO YOU THINK THIS BENEFITED THE LOCAL COMMUNITY?	
				YES	NO
a) Work with the National Police / Army (e.g. patrols)?	O	O	O	O	O
b) Assist in the building of infrastructure e.g. wells / roads?	O	O	O	O	O
c) Train local Police / Army?	O	O	O	O	O
d) Take part in Hearts and Minds campaigns, e.g. interacted with the community?	O	O	O	O	O
e) Work with DFAT* / NGO** or Aid organisations*** to assist the locals?	O	O	O	O	O

* DFAT = Department of Foreign Affairs and Trade
** NGO = Non-Government Organisation
*** Aid Organisation = e.g. Red Cross

3.8 How much do you agree or disagree with the following statements?

Please shade ONE circle for each statement under the answer that best describes how you felt during your deployment to the MEAO.

	STRONGLY AGREE	AGREE	NEITHER AGREE NOR DISAGREE	DISAGREE	STRONGLY DISAGREE
a) I felt a sense of comradeship (or closeness) between myself and other people in my Unit	O	O	O	O	O
b) There was someone I could go to in my Unit if I had a personal problem	O	O	O	O	O
c) My superiors were interested in what I did or thought	O	O	O	O	O
d) I felt well informed about what was going on in my Unit	O	O	O	O	O
e) I had good communication with other Australian forces / Australian H.Q. from my Unit	O	O	O	O	O

Section Four: Your Health on Deployment

4.1 How many times did you attend sick parade during your LAST deployment to the MEAO?

If you did attend sick parade: What was the reason? (please shade all that apply)

	YES	NO	IF YES NUMBER OF DAYS OUT OF ROLE
a) Injury from a motor vehicle accident	O	O	
b) Injury sustained in combat	O	O	
c) Musculoskeletal injury sustained in your job / role (not combat related)	O	O	
d) Musculoskeletal injury sustained during training	O	O	
e) Musculoskeletal injury sustained during recreation or sport	O	O	
f) Head injury / concussion	O	O	
If YES, how long were you unconscious? days hours minutes			
g) Heat stress / exhaustion / dehydration	O	O	
h) Effects of cold or exposure	O	O	
i) Respiratory illness (e.g. cold / flu)	O	O	
If YES, did you have a fever?	O	O	
j) Dental problems	O	O	
k) Skin rashes / irritations	O	O	
l) Diarrhoea and/or vomiting	O	O	
m) Other, please specify:	O	O	

Section Four: Your Health on Deployment

If you had diarrhoea or vomiting during your last deployment to the MEAO:

4.2 Did the symptoms of diarrhoea and/or vomiting prevent you from carrying out your duties? O Yes O No O Not Applicable, I did not have diarrhoea or vomiting

4.3 Did you need intravenous fluids (a drip) as a result of diarrhoea and/or vomiting? O Yes O No O Not Applicable, I did not have diarrhoea or vomiting

4.4 Did the symptoms of diarrhoea or vomiting resolve when you exited the MEAO? O Yes O No O Not Applicable, I did not have diarrhoea or vomiting

In regard to your sleep and rest while on your last deployment to the MEAO:

4.5 How well did you sleep? O Very poorly O Poorly O Neither good nor poorly O Good O Very good

4.6 How satisfied were you with your sleep?
O Very dissatisfied O Dissatisfied O Neither satisfied nor dissatisfied O Satisfied O Very satisfied

4.7 Did you have difficulties with sleeping?
O Not at all O A little O A moderate amount O Very much O An extreme amount

4.8 How much did any sleep problems worry you?
O Not at all O A little O A moderate amount O Very much O An extreme amount

4.9 Did you take any medication to help you sleep? O No O Yes, once or twice O Yes, regularly

4.10 During your last deployment to the MEAO, on an average day, how many 250 - 375ml beverages containing caffeine did you drink (such as caffeine containing energy drinks, coffee, tea, coca-cola)?
O None O 1-2 per day O 3-5 per day O 6-10 per day O 11 or more per day

Section Four: Your Health on Deployment

4.11 During your last deployment to the MEAO, did you take any of the following supplements?

a) Body building supplements (such as amino acids, weight gain products, creatine, etc.)

O Never O Less than once a month O Monthly O Weekly O Daily or almost daily

If YES, what was the name (generic or brand name) of the supplement that you used?

b) Energy supplements (such as energy drinks, pills, or energy enhancing herbs)

O Never O Less than once a month O Monthly O Weekly O Daily or almost daily

If YES, what was the name (generic or brand name) of the supplement that you used?

c) Weight loss supplements

O Never O Less than once a month O Monthly O Weekly O Daily or almost daily

If YES, what was the name (generic or brand name) of the supplement that you used?

4.12 Compared to your health BEFORE your last deployment to the MEAO, how would you rate your health in general NOW?

O Much better now O Somewhat better now O About the same O Somewhat worse now O Much worse now

4.13 To what extent do you agree with the following statement?

The change in my health is because of my last deployment to the MEAO.

O Strongly Agree O Agree O Neither Agree nor Disagree O Not applicable O Disagree O Strongly Disagree

Section Five: Other Deployment Experiences

5.1 During your last deployment to the MEAO, did you have any major personal problems at home? (e.g. financial problems, family problems, etc). Please shade ONE circle for each statement.

	AGREE	DISAGREE	NOT APPLICABLE
a) I received enough personal support from my family	O	O	O
b) I had serious financial problems	O	O	O
c) My partner / spouse left me	O	O	O
d) There were problems with my children	O	O	O
e) I was concerned I might lose my civilian job	O	O	O
f) I faced other major problems at home whilst deployed	O	O	O

5.2 Did the military provide any reassurance / support to your spouse / partner whilst you were deployed? (e.g. phone calls or visits, arranging 'get togethers' with other service families, newsletters, etc.)

- O Yes, it was sufficient
- O Yes, but it was not sufficient
- O No
- O Not applicable

Section Six: Post Deployment Experiences

6.1 Why did you exit from theatre? (Please shade ONE circle only)

- O End of Deployment
- O CASEVACed through combat related injury
- O CASEVACed through non-combat related injury
- O Compassionate leave
- O Problems at home
- O Routine change of role / appointment / posting
- O To attend professional courses
- O Other, please specify:

6.2 Did you receive a Return to Australia Psychological Screen brief? O Yes O No

If YES:

6.3 Do you believe this process was useful? (please shade ONE circle only)

O Not at all useful O Not particularly useful O Neither useful nor un-useful O Somewhat useful O Extremely useful

6.4 After leaving the theatre of operation, did you have a short period of time somewhere away from the operation area for you to relax before returning to your home base?

O Yes O No - **please skip to question 6.6**

6.5 **If YES:**

a) For how many days?

b) Was the majority of this time ?

- O Structured (a daily programme of activities, e.g. fitness)
- O Unstructured (no planned activities)

c) Did you find this period of time useful? O Yes O No

d) What were the good points?

e) What were the bad points?

Section Six: Post Deployment Experiences

6.6 After returning to your usual home base, were you required to spend some time in or around your home Unit before being allowed to go on Post Operational Leave?

- O Yes
- O No - **please skip to question 6.8**
- O Not applicable, did not go on Post Operational Leave - **please skip to question 6.8**

6.7 **If YES:**

a) For how many days were you required at your home Unit? ☐☐☐

b) Was the majority of this time.. ?
- O Structured (a daily programme of activities e.g. fitness / administration)
- O Unstructured (no planned activities)

c) Did you find this period of time useful? O Yes O No

d) What were the good points?

e) What were the bad points?

6.8 How long was it before you could relax properly on return to Australia?

O Immediately O 1 Week O 2 Weeks O 3-4 Weeks O 4-8 Weeks O 9 or more weeks O Have not

6.9 How long before you stopped scanning the environment for risk?

O Immediately O 1 Week O 2 Weeks O 3-4 Weeks O 4-8 Weeks O 9 or more weeks O Have not

6.10 Overall, do you think the Australian public were supportive of the mission to the MEAO during your MOST RECENT deployment? O Yes O No

6.11 Since returning home from your last deployment, has anyone had a go at you, or given you a hard time because you went to the MEAO? O Yes O No

Section Six: Post Deployment Experiences

6.12 To what extent do you agree or disagree with the following statements?

In the weeks after I came home

	AGREE	DISAGREE	NOT APPLICABLE
a) I was well supported by the military	O	O	
b) I found it difficult to adjust to being back home	O	O	
c) People didn't understand what I had been through	O	O	
d) I did not want to talk about my experiences with my family / friends	O	O	
e) I found it difficult to resume my normal social activities	O	O	
f) I had serious financial problems	O	O	
g) I argued more with my spouse / partner	O	O	O
h) I have been let down by people who I thought would stand by me	O	O	
i) I had other major problems on return from deployment	O	O	

6.13 Were any of the following a problem?

a) Loss of seniority, promotion opportunity, or responsibility	O Yes	O No
b) Medical classification (MEC) downgraded	O Yes	O No

6.14 Overall, have your experiences on YOUR LAST DEPLOYMENT TO THE MEAO made you more or less likely to continue your military career?

O Very Likely O No difference O Less likely O Already Discharged

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Section Six: Post Deployment Experiences

6.15 Were you married or in a significant relationship when you last deployed to the MEAO?	O Yes O No - go to question 6.17						
If YES: 6.16 In the weeks after you returned from your deployment:							
a) How well did your partner meet your needs?	Poorly	O 1	O 2	O 3	O 4	O 5	Extremely well
b) How good was your relationship compared to most?	Poor	O 1	O 2	O 3	O 4	O 5	Excellent
c) How often did you wish you hadn't married or lived together?	Never	O 1	O 2	O 3	O 4	O 5	Very Often
d) To what extent did your marriage or relationship meet your original expectations?	Hardly at all	O 1	O 2	O 3	O 4	O 5	Completely

e) Which best described the degree of happiness, all things considered, in your relationship at the time?

O Extremely unhappy	O Fairly unhappy	O A little unhappy	O Happy	O Very happy	O Extremely happy	O Perfectly happy

Please answer the following questions if you DEPLOYED AS A RESERVIST.

Otherwise, please go to Section Seven.

6.17 Were you in civilian employment at the time of your call-up for deployment?

O Yes O No O Already in full time regular service or equivalent

6.18 Post-deployment, did you return to the same job you held before your deployment?

- O Yes
- O No, resigned at time of call-up / mobilisation
- O No, contract of employment ended just before / during deployment
- O No, employer kept job open for me but I chose not to return
- O No, employer did not keep job open for me, but I wanted to return
- O No, employer did not keep job open for me, and I didn't want to return
- O No, other reason, please specify

6.19 Were any of the following a problem?

	YES	NO	NOT APPLICABLE
a) Loss of seniority, promotion opportunity, or responsibility in civilian job	O	O	O
b) Loss of income during call-up	O	O	O
c) Resentment from co-workers	O	O	O

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Section Seven: Final Questions

As a check of our coverage in this questionnaire, please answer these final questions.

7.1 Are there other important military experiences or exposures we have not asked you about? O Yes O No

If YES: please give details in the space provided

Thank you for your time and effort in completing this questionnaire.

9.4. South East Life Study Consent Form

THE UNIVERSITY OF ADELAIDE AUSTRALIA

CONSENT FORM (Please post this copy back)

PROTOCOL NAME: THE SOUTH EAST LIFE STUDY

1. I, …… *(please print name)*

consent to take part in the following components of the research project entitled: **THE SOUTH EAST LIFE STUDY** *(please tick ALL of the study components you give your consent to):*

- ☐ Self Report Questionnaire
- ☐ Telephone Interview
- ☐ Data Matching with Medicare and PBS information
- ☐ Saliva collection for genetic testing

2. Furthermore, I consent to the storage and use of the saliva sample provided by me for use in:

(please tick ALL of the study components you give your consent to):

- ☐ This specific research project
- ☐ Other research that is closely related to this research project
- ☐ Any future research

3. ☐ I consent to be contacted in the future to be informed about related research that I may be interested in participating in.

4. I acknowledge that I have read the attached Information Sheet entitled: THE SOUTH EAST LIFE STUDY.

5. I have had the project, so far as it affects me, fully explained to my satisfaction by the research officer. My consent is given freely.

6. Although I understand that the purpose of this research project is to improve the quality of medical care, it has also been explained that my involvement may not be of any direct benefit to me.

7. I have had the opportunity to discuss this project with a family member or friend.

8. I have been informed that, while information gained during the study may be published, I will not be identified and my personal results will not be divulged.

9. I understand that I am free to withdraw from the project at any time and that this will not affect medical advice in the management of my health, now or in the future.

10. I am aware that I should retain a copy of this Consent Form, when completed, and the attached Information Sheet.

……..

(signature) *(date)*

I have described to the participant the nature of the research to be carried out. In my opinion she/he understood the explanation.

Name: ……

……..

(signature) *(date)*

THE UNIVERSITY OF ADELAIDE AUSTRALIA

CONSENT FORM (Copy for your records)

PROTOCOL NAME: THE SOUTH EAST LIFE STUDY

1. I, ……*(please print name)* consent to take part in the following components of the research project entitled: **THE SOUTH EAST LIFE STUDY** *(please tick ALL of the study components you give your consent to):*

   ☐ Self Report Questionnaire

   ☐ Telephone Interview

   ☐ Data Matching with Medicare and PBS information

   ☐ Saliva collection for genetic testing

2. Furthermore, I consent to the storage and use of the saliva sample provided by me for use in:

   (please tick ALL of the study components you give your consent to):

   ☐ This specific research project

   ☐ Other research that is closely related to this research project

   ☐ Any future research

3. ☐ I consent to be contacted in the future to be informed about related research that I may be interested in participating in.

4. I acknowledge that I have read the attached Information Sheet entitled: THE SOUTH EAST LIFE STUDY.

5. I have had the project, so far as it affects me, fully explained to my satisfaction by the research officer. My consent is given freely.

6. Although I understand that the purpose of this research project is to improve the quality of medical care, it has also been explained that my involvement may not be of any direct benefit to me.

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8. I have been informed that, while information gained during the study may be published, I will not be identified and my personal results will not be divulged.

9. I understand that I am free to withdraw from the project at any time and that this will not affect medical advice in the management of my health, now or in the future.

10. I am aware that I should retain a copy of this Consent Form, when completed, and the attached Information Sheet.

……..

(signature) *(date)*

I have described to the participant the nature of the research to be carried out. In my opinion she/he understood the explanation.

Name: ……

……..

(signature) *(date)*

9.5. South East Life Study follow-up questionnaire

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Study ID: | | | | |

Instructions

Please Read

Thank you for completing this questionnaire. The following pages contain questions asking about different aspects of your life. Most of the questions are straightforward, but please let us know if there are any questions you do not understand when we ring you for your interview or feel free to ring the research team on 1800 613 904.

Although some of the questions may seem repetitive or irrelevant, it is important that you answer every question to the best of your ability.

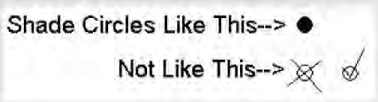
We encourage you to work through the questions quickly without spending too long on any one question. There are no right or wrong answers. We sincerely thank you for your participation in this study, and look forward to receiving your questionnaire in the post.

For optimum accuracy please:

Print in capital letters and avoid contact with the edge of the box. For example:

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

Shade circles, rather than ticking or crossing them. For example:



If you make a mistake and wish to change your answer, simply cross out your mistake and choose the answer that is right for you.

Please use blue or black pen, not pencil.

Thank you very much for your co-operation

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Demographics

1. What is the current date? ☐☐ / ☐☐ / ☐☐☐☐

2. What is your sex? O Male O Female

3. What is your age? ☐☐ years

4. What is your current marital status?
- O Married
- O Separated
- O Divorced
- O Never Married
- O Widowed
- O Not married but living together with a partner

5. Which of the following best describes the highest qualification you have completed?
- O High School or part of
- O Nursing Qualification
- O Teaching Qualification
- O Trade Certificate / Apprenticeship
- O Technician's Certificate / Advanced Certificate
- O Certificate other than above
- O Associate Diploma
- O Undergraduate Diploma
- O Bachelor Degree
- O Post Graduate Diploma
- O Masters Degree / Doctorate
- O Other (please specify):

6. Which of the following best describes your current occupational status?
- O Work Part Time / Casual
- O Work Full Time
- O Unemployed but looking for work
- O Unemployed not looking for work
- O On Worker's Compensation
- O On Disability Pension
- O Unpaid Voluntary Work
- O Student
- O Home Duties
- O Other (please specify):

7. What is the approximate annual gross income for your household? That is a sum of the incomes of all people in your house before tax is taken out.
- O Up to $7000
- O $7001 to $12 000
- O $12 001 to $20 000
- O $20 001 to $30 000
- O $30 001 to $40 000
- O $40 001 to $50 000
- O $50 001 to $60 000
- O $60 001 to $80 000
- O More than $80 000
- O Don't know
- O Prefer to be kept private

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Demographics

8. What is your main source of income?

- O Profit or loss from own business / partnership
- O Profit or loss from rental / investment properties
- O Dividends
- O Interest
- O Wage / Salary from employer
- O Wage Salary from own limited liability company
- O Family Payment
- O Any other government pension or allowance
- O Child support / maintenance
- O Superannuation / Annuity
- O Worker's Compensation / Sickness benefits
- O Any other regular income (please specify):

9. If you are currently working part-time or full-time, what is your occupation?

10. On average, how many hours per week do you work? ☐☐ hours

11. During the last one month, how many days in total were you unable to carry out your usual daily activities fully? ☐☐ days

12. During the last one month, how many days in total did you stay in bed all or most of the day because of illness or injury? ☐☐ days

13. How many children do you have? ☐☐ children

14. Including yourself, how many people live in your household? (Only include those who live with you more than 50% of the time). ☐☐ people

15. If you do not live alone, please indicate who resides with you (shade all applicable categories).

- O Live with Spouse / Partner
- O Live with Child / Children
- O Live with Other Relative
- O Live with Non-Relative
- O N/A Live Alone
- O Other, please specify:

16. What is your height without shoes? ☐☐☐ cm OR ☐ foot ☐☐ inches

17. What is your weight? (Undressed in the morning) ☐☐☐ kg OR ☐☐ stone ☐☐ pounds

18. Do you consider yourself to be? O An acceptable weight O Underweight O Overweight

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Demographics

19. Have you smoked at least 100 cigarettes in your entire life?	O No O Yes
20. How old were you when you first began to smoke cigarettes fairly regularly?	☐☐ years
21. Do you smoke cigarettes now?	O No O Yes, regularly O Yes, occasionally
22. If **YES**; on average, about how many cigarettes a day do you smoke?	☐☐☐
23. If you used to smoke cigarettes but don't smoke now, about how many cigarettes a day did you smoke?	☐☐☐
24. How old were you when you quit?	☐☐ years

25. In the last 2 weeks have you regularly taken any tablets or medicines bought from a pharmacy, supermarket, health shop, etc.? O No O Yes

26. What are the medicines for? (Please shade all appropriate responses)

O Sleeping	O Diabetes
O To keep you calm	O Asthma
O Water	O Contraception
O Blood pressure	O Hormones (HRT)
O Heart	O Stress
O Infection	O Anxiety
O Depression	O Mental health problem
O Pain relief	O Something else:

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Health Problems

	Has a medical doctor ever diagnosed you with, or treated you for any of the following medical problems or conditions?	Has a medical doctor treated you for any of the following medical problems or conditions in the past year?
1. High blood pressure?	O No O Yes	O No O Yes
2. Migraines?	O No O Yes	O No O Yes
3. Asthma?	O No O Yes	O No O Yes
4. Hepatitis or yellow jaundice?	O No O Yes	O No O Yes
5. Bowel disorder (i.e diarrhoea, constipation, bleeding)?	O No O Yes	O No O Yes
6. Irritable Bowel Syndrome?	O No O Yes	O No O Yes
7. Diabetes?	O No O Yes	O No O Yes
8. A thyroid problem?	O No O Yes	O No O Yes
9. Any significant infections (i.e. hepatitis, HIV, pneumonia, glandular fever, leishmaniasis)	O No O Yes	O No O Yes
10. Arthritis or rheumatism?	O No O Yes	O No O Yes
11. Fibrositis or fibromyalgia?	O No O Yes	O No O Yes
12. Back or neck problems?	O No O Yes	O No O Yes
13. Joint problems?	O No O Yes	O No O Yes
14. Sinus problems?	O No O Yes	O No O Yes
15. Ear infection?	O No O Yes	O No O Yes
16. Dermatitis?	O No O Yes	O No O Yes
17. Eczema?	O No O Yes	O No O Yes
18. Psoriasis?	O No O Yes	O No O Yes
19. Chronic fatigue syndrome?	O No O Yes	O No O Yes
20. Hay-fever?	O No O Yes	O No O Yes
21. Any disease of the genital organs?	O No O Yes	O No O Yes
22. Low fertility?	O No O Yes	O No O Yes
23. Sexual problems?	O No O Yes	O No O Yes
24. Premenstrual tension?	O No O Yes	O No O Yes
25. Period problems?	O No O Yes	O No O Yes
26. Miscarriages?	O No O Yes	O No O Yes

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Quality of Life

1. How do you feel about your life as a whole, taking into account what has happened in the last year and what you expect to happen in the future?

O Delighted O Pleased O Mostly satisfied O Mixed O Mostly dissatisfied O Unhappy O Terrible

2. How do you feel about your independence and freedom - the chance you have to do what you want?

O Delighted O Pleased O Mostly satisfied O Mixed O Mostly dissatisfied O Unhappy O Terrible

Somatic Symptoms

We would like to know about your general health. For all questions, please fill in the appropriate response circle.

Over the past few weeks have you been troubled by:

	NEVER OR SOME OF THE TIME	A GOOD PART OF THE TIME	MOST OF THE TIME
1. Headaches?	O	O	O
2. Feeling irritable or cranky?	O	O	O
3. Poor memory?	O	O	O
4. Pains in your arms or legs?	O	O	O
5. Feeling nervous or tense?	O	O	O
6. Muscle pain after activity?	O	O	O
7. Waking up tired?	O	O	O
8. Rapidly changing moods?	O	O	O
9. Fainting spells?	O	O	O
10. Nausea?	O	O	O
11. Arms or legs feeling heavy?	O	O	O
12. Feeling unhappy and depressed?	O	O	O
13. Gas or bloating?	O	O	O
14. Fevers?	O	O	O
15. Back pain?	O	O	O

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Somatic Symptoms

Over the past few weeks have you been troubled by:

	NEVER OR SOME OF THE TIME	A GOOD PART OF THE TIME	MOST OF THE TIME
16. Needing to sleep longer?	O	O	O
17. Prolonged tiredness after activity?	O	O	O
18. Sore throats?	O	O	O
19. Numb or tingling sensations?	O	O	O
20. Feeling constantly under strain?	O	O	O
21. Joint pain?	O	O	O
22. Weak muscles?	O	O	O
23. Feeling frustrated?	O	O	O
24. Diarrhoea or constipation?	O	O	O
25. Poor sleep?	O	O	O
26. Getting annoyed easily?	O	O	O
27. Everything getting on top of you?	O	O	O
28. Dizziness?	O	O	O
29. Feeling tired after rest or relaxation?	O	O	O
30. Poor concentration?	O	O	O
31. Tired muscles after activity?	O	O	O
32. Feeling lost for words?	O	O	O
33. Losing confidence?	O	O	O
34. Being unable to overcome difficulties?	O	O	O

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Alcohol

In answering the following questions, please remember that a standard drink contains 10g of pure alcohol.

Each of these is one standard drink:
1 Middy/Pot/Schooner of Standard Beer
1 Pint of Light Beer
1 Glass of Table Wine
1 Glass of Sherry or Port
1 Nip of Spirits

1. How often do you have a drink containing alcohol?	Never O	Monthly or Less O	Once a week or less O	2-4 times a week O	5 or more times a week O
2. How many standard drinks do you have on a typical day when you are drinking?	1 O	2 O	3 or 4 O	5 to 6 O	7 or more O

	NEVER	LESS THAN MONTHLY	MONTHLY	WEEKLY	DAILY OR ALMOST DAILY
3. How often do you have 6 or more standard drinks on one occasion?	O	O	O	O	O
4. How often during the last year have you found that you were not able to stop drinking once you had started?	O	O	O	O	O
5. How often during the last year have you failed to do what was normally expected from you because of your drinking?	O	O	O	O	O
6. How often during the last year have you needed an alcoholic drink in the morning to get yourself going after a heavy drinking session?	O	O	O	O	O
7. How often during the last year have you had a feeling of guilt or regret after drinking?	O	O	O	O	O
8. How often during the last year have you been unable to remember what happened the night before because you had been drinking?	O	O	O	O	O

9. Have you or someone else been injured as a result of <u>your</u> drinking?	No O	Yes, but not in the last year O	Yes, during the last year O
10. Has a friend, doctor or other health worker been concerned about your drinking or suggested you cut down?	No O	Yes, but not in the last year O	Yes, during the last year O

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Gambling

1. Were you involved in gambling in the last 12 months? O Yes O No

If NO, please skip to the next section: Suicidal Ideation and Behaviour.

2. What is your preferred mode of gambling?

- O Poker Machines
- O Casino games
- O Private card games
- O Horse / dog racing
- O Sports betting
- O Lottery / Scratchies
- O Other, please specify:

3. On the whole do you: O Win more than you lose O Lose more than you win?

If **LOSE MORE THAN YOU WIN:** On average how much do you lose per session? $

4. How frequently do you gamble?

- O More than once a week
- O Once a week
- O Once a fortnight
- O Once a month
- O Once every 3 months
- O Other, please specify:

5. Approximately how long do you gamble in each session? hours

6. Reasons for gambling?

- O Win money
- O Escape from life problems
- O Chase losses
- O Entertainment
- O Other, please specify:

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Gambling

If you have not gambled in the last 12 months, please go to the next section: Suicidal Ideation and Behaviour.

Thinking about the last 12 months:

	NEVER	SOMETIMES	MOST OF THE TIME	ALMOST ALWAYS
7. Have you bet more than you could really afford to lose?	O	O	O	O
8. Have you needed to gamble with larger amounts of money to get the same feeling of excitement?	O	O	O	O
9. When you gambled, did you go back another day to try to win back the money you lost?	O	O	O	O
10. Have you borrowed money or sold anything to get money to gamble?	O	O	O	O
11. Have you felt that you might have a problem with gambling?	O	O	O	O
12. Has gambling caused you any health problems, including stress or anxiety?	O	O	O	O
13. Have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?	O	O	O	O
14. Has your gambling caused any financial problems for you or your household?	O	O	O	O
15. Have you felt guilty about the way you gamble or what happens when you gamble?	O	O	O	O
16. Have you lied to family members or others to hide your gambling?	O	O	O	O
17. Have you bet or spent more money than you wanted to on gambling?	O	O	O	O
18. Have you wanted to stop betting money or gambling, but didn't think you could?	O	O	O	O

Suicidal Ideation and Behaviour

1. In the past month did you think you would be better off dead or wish you were dead?	O No	O Yes
2. In the past month did you want to harm yourself?	O No	O Yes
3. In the past month did you think about suicide?	O No	O Yes
4. In the past month did you have a suicide plan?	O No	O Yes
5. In the past month did you attempt suicide?	O No	O Yes
6. In your lifetime did you ever make a suicide attempt?	O No	O Yes

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Recent Life Events

In the last 12 months, have you been personally affected by any of the following?

Please shade the YES box if the event has occurred. Please shade the STILL AFFECTS ME box if the event is still having an effect on your life. (**immediate family includes: mother, father, sister, brother, partner, child**)

1. Have you had a serious illness or been seriously injured?	O No	O Yes	O Still affects me
2. Has one of your immediate family been seriously ill or injured?	O No	O Yes	O Still affects me
3. Have any of your close friends or other close relatives been seriously ill or injured?	O No	O Yes	O Still affects me
4. Have any of your immediate family died?	O No	O Yes	O Still affects me
5. Have any of your other close relatives or close friends died?	O No	O Yes	O Still affects me
6. Have you separated from your partner (not including death)?	O No	O Yes	O Still affects me
7. Have you had any serious problem with a close friend, neighbour or relative?	O No	O Yes	O Still affects me
8. Have you, or an immediate family member been subject to serious racial abuse, attack or threats?	O No	O Yes	O Still affects me
9. Have you or an immediate family member been subject to any abuse, attack or threat, perhaps due to you or someone close to you having a disability of any kind (e.g. a mental health problem, a learning disability or a physical problem)?	O No	O Yes	O Still affects me
10. Have you or an immediate family member been subject to any other form of serious abuse, attack or threat?	O No	O Yes	O Still affects me
11. Have you or your partner been unemployed or seeking work for more than one month?	O No	O Yes	O Still affects me
12. Have you or your partner been sacked from your job or made redundant?	O No	O Yes	O Still affects me
13. Have you had any major financial difficulties (e.g. debts, difficulty paying bills)?	O No	O Yes	O Still affects me
14. Have you, or an immediate member of your family had any police contact or been in a court appearance?	O No	O Yes	O Still affects me
15. Have you or an immediate family member been burgled or mugged?	O No	O Yes	O Still affects me
16. Have you or another individual who lives with you given birth?	O No	O Yes	O Still affects me
17. Have you or another individual who lives with you suffered from a miscarriage or had a still birth?	O No	O Yes	O Still affects me
18. Have you moved house (through choice)?	O No	O Yes	O Still affects me
19. Have you moved house (not through choice)?	O No	O Yes	O Still affects me
20. Have you had any housing difficulties?	O No	O Yes	O Still affects me
21. Have you had any other significant event?	O No	O Yes	O Still affects me

If YES, please specify:

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Adult Separation Anxiety

The following statements refer to symptoms that you might have experienced as an adult (over the age of 18 years). Please shade the appropriate circle for each item, according to whether you have experienced any of these symptoms. Please remember to answer all questions.

	THIS HAPPENS VERY OFTEN	THIS HAPPENS FAIRLY OFTEN	THIS HAPPENS OCCASIONALLY	THIS HAS NEVER HAPPENED
1. Have you felt more secure at home when you are with people that are close to you?	O	O	O	O
2. Have you experienced difficulty in staying away from home for several hours at a time?	O	O	O	O
3. Have you been carrying around something in your purse or wallet that gives you a sense of security or comfort?	O	O	O	O
4. Have you experienced extreme stress before leaving home to go on a long trip?	O	O	O	O
5. Have you suffered from nightmares or dreams about being separated from someone close to you?	O	O	O	O
6. Have you experienced extreme stress before leaving someone close to you when going away on a trip?	O	O	O	O
7. Have you become very upset when your usual daily routine is disrupted?	O	O	O	O
8. Have you been worried about the intensity of your relationship with those people closest to you, e.g. that you are too strongly attached?	O	O	O	O
9. Have you experienced symptoms such as headaches, stomach-aches or nausea (or other) before leaving for work or other regular activity outside the home?	O	O	O	O
10. Do you find that you talk a lot in order to keep people close to you?	O	O	O	O
11. Have you been especially concerned about where people close to you are going when you are separated from them, eg. when you leave them to go to work or go out of the house?	O	O	O	O
12. Have you experienced difficulty in sleeping alone at night, eg. is your sleep better if someone close to you is in the house?	O	O	O	O
13. Have you noticed that you are better able to go off to sleep if you can hear voices of people you are close to or the sound of the TV or radio?	O	O	O	O
14. Have you become very distressed when thinking about being away from people that are close to you?	O	O	O	O
15. Have you suffered from nightmares or dreams about being away from home?	O	O	O	O

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Adult Separation Anxiety

	THIS HAPPENS VERY OFTEN	THIS HAPPENS FAIRLY OFTEN	THIS HAPPENS OCCASIONALLY	THIS HAS NEVER HAPPENED
16. Have you been worrying a lot about people close to you coming to serious harm, for example, meeting with a car accident, or suffering from a fatal illness?	O	O	O	O
17. Have you become very upset with changes to your usual daily routine if they interfere with your contact with persons close to you?	O	O	O	O
18. Have you been worrying a lot about people you care about leaving you?	O	O	O	O
19. Have you found that you sleep better if the lights are on in the house or in the bedroom?	O	O	O	O
20. Have you tried to avoid being at home alone especially when people close to you are out?	O	O	O	O
21. Have you suffered from sudden bouts of anxiety or panic attacks (e.g. sudden shaking, sweating, shortness of breath, pounding heart) when thinking about leaving people close to you or about them leaving you?	O	O	O	O
22. Have you found that you get anxious if you do not speak to people that are close to you on the telephone regularly, e.g. daily?	O	O	O	O
23. Have you been afraid that you would not be able to cope or could not go on if someone you cared about left you?	O	O	O	O
24. Have you suffered from sudden bouts of anxiety or panic attacks (e.g. sudden shaking, sweating, shortness of breath, pounding heart) when separated from people close to you?	O	O	O	O
25. Have you been worrying a lot about possible events that may separate you from those close to you, e.g. because of work requirements?	O	O	O	O
26. Have people close to you mentioned that you 'talk a lot'?	O	O	O	O
27. Have you been worrying that your relationships with some people are so close that it may cause them problems?	O	O	O	O

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Anxiety and Depression

Please shade the most correct answer. Don't spend too long thinking about each answer. Answer as you are feeling now.

1. I feel tense or 'wound up': O Most of the time O A lot of the time O From time to time, occasionally O Not at all

2. I still enjoy the things I used to enjoy: O Definitely as much O Not quite so much O Only a little O Hardly at all

3. I get a sort of frightened feeling as if something awful is about to happen:
   - O Very definitely and quite badly
   - O Yes, but not too badly
   - O A little, but it doesn't worry me
   - O Not at all

4. I can laugh and see the funny side of things:
   - O As much as I always could
   - O Not quite so much now
   - O Definitely not so much now
   - O Not at all

5. Worrying thoughts go through my mind:
   - O A great deal of the time
   - O A lot of the time
   - O From time to time, but not too often
   - O Only occasionally

6. I feel cheerful: O Not at all O Not often O Sometimes O Most of the time

7. I can sit at ease and feel relaxed: O Definitely O Usually O Not often O Not at all

8. I feel as if I am slowed down: O Nearly all the time O Very often O Sometimes O Not at all

9. I get a sort of frightened feeling like 'butterflies' in the stomach: O Not at all O Occasionally O Quite often O Very often

10. I have lost interest in my appearance:
    - O Definitely
    - O I don't take as much care as I should
    - O I may not take quite as much care
    - O I take just as much care as ever

11. I feel restless as I have to be on the move: O Very much indeed O Quite a lot O Not very much O Not at all

12. I look forward with enjoyment to things:
    - O As much as I ever did
    - O Rather less than I used to
    - O Definitely less than I used to
    - O Hardly at all

13. I get sudden feelings of panic: O Very often indeed O Quite often O Not very often O Not at all

14. I can enjoy a good book or radio or TV program: O Often O Sometimes O Not often O Very seldom

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Anger

Please answer all questions by shading the correct answer or the answer that seems most appropriate to you.

1. Over the past six months, have you felt irritable or easily angered? O Always O Often O Sometimes O Never

2. Do you feel, over the past six months, you have overreacted with anger or rage to minor annoyances or trivial issues? O Yes O No

3. Over the past six months, have you had "anger attacks", episodes where you would become angry and enraged with other people in a way that you thought was excessive or inappropriate to the situation? O Yes O No

If YES: 4. How many anger attacks of this sort have you had over the past month? ☐☐☐

5. During at least one of the anger attacks, have you experienced any of the following symptoms:

	YES	NO
a. Accelerated heart rate, heart pounding or palpitations	O	O
b. Hot flushes or face reddening	O	O
c. Tightness of the chest, chest pain or pressure	O	O
d. Numbness or tingling sensation of arms or legs	O	O
e. Light-headedness, dizziness, or feelings of unsteadiness	O	O
f. Shortness of breath or difficulty breathing	O	O
g. Sweating	O	O
h. Shaking or trembling	O	O
i. Intense fear, panicky feelings, or anxiety	O	O
j. Feeling out of control	O	O
k. Feeling like you are about to explode	O	O
l. Feeling like yelling at people	O	O
m. Feeling like physically attacking people	O	O
n. Verbally attacking people	O	O
o. Physically attacking people	O	O
p. Throwing things around or destroying objects	O	O

6. Do you consider these anger attacks to be uncharacteristic of you? O Not like me at all O A little like me O Half like me O Mostly like me O Completely like me

7. Do you feel guilty about these anger attacks? O Every time O Most times O Half and half O Occasionally O Never

8. Do you regret your actions afterwards? O Every time O Most times O Half and half O Occasionally O Never

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Stressful Life Event

Below is a list of problems and complaints that people sometimes have in response to stressful life experiences. Please read each one carefully, then shade the circle to indicate how much you have been bothered by that problem in the past month.

Please think about the event that affected you most. The event you experienced was:

_____ (please specify event)

On (date): ☐☐ / ☐☐ / ☐☐☐☐

In the past month, how much were you bothered by:

	NOT AT ALL	A LITTLE BIT	MODERATELY	QUITE A BIT	EXTREMELY
1. Repeated, disturbing, and unwanted memories of the stressful experience?	O	O	O	O	O
2. Repeated, disturbing dreams of the stressful experience?	O	O	O	O	O
3. Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were actually back there reliving it)?	O	O	O	O	O
4. Feeling very upset when something reminded you of the stressful experience?	O	O	O	O	O
5. Having strong physical reactions when something reminded you of the stressful experience (e.g. heart pounding, trouble breathing, sweating)?	O	O	O	O	O
6. Avoiding internal reminders of the stressful experience (e.g. thoughts, feelings, or physical sensations)?	O	O	O	O	O
7. Avoiding external reminders of the stressful experience (e.g. people, places, conversations, objects, activities, or situations)?	O	O	O	O	O
8. Trouble remembering important parts of the stressful experience?	O	O	O	O	O
9. Having strong negative beliefs about yourself, other people, or the world (e.g. having thoughts such as: I am bad, there is something seriously wrong with me, no one can be trusted, the world is completely dangerous)?	O	O	O	O	O
10. Blaming yourself or someone else strongly for the stressful experience or what happened after it?	O	O	O	O	O
11. Having strong negative feelings such as fear, horror, anger, guilt, or shame?	O	O	O	O	O
12. Loss of interest in activities that you used to enjoy?	O	O	O	O	O
13. Feeling distant or cut off from other people?	O	O	O	O	O
14. Having trouble experiencing positive feelings (e.g. being unable to have loving feelings for those close to you, or feeling emotionally numb)?	O	O	O	O	O
15. Feeling irritable or angry or acting aggressively?	O	O	O	O	O
16. Taking too many risks or doing things that cause you harm?	O	O	O	O	O
17. Being "superalert" or watchful or on guard?	O	O	O	O	O

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Stressful Life Event

	NOT AT ALL	A LITTLE BIT	MODERATELY	QUITE A BIT	EXTREMELY
18. Feeling jumpy or easily startled?	O	O	O	O	O
19. Having difficulty concentrating?	O	O	O	O	O
20. Trouble falling or staying asleep?	O	O	O	O	O

Relationships

	NOT AT ALL			MODERATELY			VERY MUCH
1. I worry about being abandoned	O	O	O	O	O	O	O
2. I am very comfortable being close	O	O	O	O	O	O	O
3. I worry a lot about my relationships	O	O	O	O	O	O	O
4. I worry that others won't care as much as I do	O	O	O	O	O	O	O
5. I worry a fair amount about losing others	O	O	O	O	O	O	O
6. I don't feel comfortable opening up to others	O	O	O	O	O	O	O
7. I want to get close, but I keep pulling back	O	O	O	O	O	O	O
8. I get nervous when others get too close to me	O	O	O	O	O	O	O
9. I avoid getting too close to others	O	O	O	O	O	O	O
10. I find it difficult to depend on others	O	O	O	O	O	O	O
11. If I can't get others to show interest in me, I get upset	O	O	O	O	O	O	O
12. When I am not involved in a relationship, I feel insecure	O	O	O	O	O	O	O

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Resilience

1. Please rate each of the following statements based on how you have felt during the past 30 days.

	NOT TRUE AT ALL	RARELY TRUE	SOMETIMES TRUE	OFTEN TRUE	TRUE NEARLY ALL THE TIME
a. I am able to adapt to change	O	O	O	O	O
b. I tend to bounce back after illness or hardship	O	O	O	O	O

Parental Information

1. If your parents are divorced or separated, what age were you when this first occurred? ☐☐ years old

2. Are either of your parents deceased? O Yes, mother O Yes, father

IF YES, what age were you when this occurred?

I was ☐☐ years old when my mother passed away.

I was ☐☐ years old when my father passed away.

What age was your mother when she passed away? ☐☐ years old

What age was your father when he passed away? ☐☐ years old

3. Has anyone else close to you died? O Yes O No

Electronic Networking

1. How often do you access a social networking site (Facebook, Twitter, etc)? O Never O Monthly O Weekly O Daily

2. How often do you perform an action on a social networking site (e.g., comment, 'like', upload photos, update status, etc)? O Never O Monthly O Weekly O Daily

3. How much friendship do you feel you receive from these sites?
O NA O Moderate
O None O Quite a bit
O Little bit O A lot

4. How important is online social networking in interacting and keeping in touch with your friends and family?

Not important at all O 1 O 2 O 3 O 4 O 5 O 6 O 7 O 8 O 9 O 10 Extremely important

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Emotion

	ALMOST NEVER (0-10%)	SOMETIMES (11-35%)	ABOUT HALF THE TIME (36-65%)	MOST OF THE TIME (66 - 90%)	ALMOST ALWAYS (91-100%)
1. I am clear about my feelings.	O	O	O	O	O
2. I pay attention to how I feel.	O	O	O	O	O
3. I experience my emotions as overwhelming and out of control.	O	O	O	O	O
4. I have no idea how I am feeling.	O	O	O	O	O
5. I have difficulty making sense out of my feelings.	O	O	O	O	O
6. I am attentive to my feelings.	O	O	O	O	O
7. I know exactly how I am feeling.	O	O	O	O	O
8. I care about what I am feeling.	O	O	O	O	O
9. I am confused about how I feel.	O	O	O	O	O
10. When I'm upset, I acknowledge my emotions.	O	O	O	O	O
11. When I'm upset, I become angry with myself for feeling that way.	O	O	O	O	O
12. When I'm upset, I become embarrassed for feeling that way.	O	O	O	O	O
13. When I'm upset, I have difficulty getting work done.	O	O	O	O	O
14. When I'm upset, I become out of control.	O	O	O	O	O
15. When I'm upset, I believe that I will remain that way for a long time.	O	O	O	O	O
16. When I'm upset, I believe that I'll end up feeling very depressed.	O	O	O	O	O
17. When I'm upset, I believe that my feelings are valid and important.	O	O	O	O	O
18. When I'm upset, I have difficulty focusing on other things.	O	O	O	O	O
19. When I'm upset, I feel out of control.	O	O	O	O	O
20. When I'm upset, I can still get things done.	O	O	O	O	O
21. When I'm upset, I feel ashamed with myself for feeling that way.	O	O	O	O	O
22. When I'm upset, I know that I can find a way to eventually feel better.	O	O	O	O	O
23. When I'm upset, I feel like I am weak.	O	O	O	O	O
24. When I'm upset, I feel like I can remain in control of my behaviors.	O	O	O	O	O

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Emotion

	ALMOST NEVER (0-10%)	SOMETIMES (11-35%)	ABOUT HALF THE TIME (36-65%)	MOST OF THE TIME (66 - 90%)	ALMOST ALWAYS (91-100%)
25. When I'm upset, I feel guilty for feeling that way.	O	O	O	O	O
26. When I'm upset, I have difficulty concentrating.	O	O	O	O	O
27. When I'm upset, I have difficulty controlling my behaviors.	O	O	O	O	O
28. When I'm upset, I believe there is nothing I can do to make myself feel better.	O	O	O	O	O
29. When I'm upset, I become irritated with myself for feeling that way.	O	O	O	O	O
30. When I'm upset, I start to feel very bad about myself.	O	O	O	O	O
31. When I'm upset, I believe that wallowing in it is all I can do.	O	O	O	O	O
32. When I'm upset, I lose control over my behaviors.	O	O	O	O	O
33. When I'm upset, I have difficulty thinking about anything else.	O	O	O	O	O
34. When I'm upset, I take time to figure out what I'm really feeling.	O	O	O	O	O
35. When I'm upset, it takes me a long time to feel better.	O	O	O	O	O
36. When I'm upset, my emotions feel overwhelming.	O	O	O	O	O

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Grief

If you have lost a loved one in the fires, please fill out the following questions:

	NOT AT ALL	AT LEAST ONCE	AT LEAST ONCE A WEEK	AT LEAST ONCE A DAY	SEVERAL TIMES A DAY
1. In the past month, how often have you felt yourself longing or yearning for the person you lost?	O	O	O	O	O
2. In the past month, how often have you had intense feelings of emotional pain, sorrow, or pangs of grief related to the lost relationship?	O	O	O	O	O
3. Has this been happening for at least 6 months?				O Yes	O No

For each of the following questions, please indicate how you currently feel on a scale of not at all, slightly, somewhat, quite a bit, or overwhelmingly.

	NOT AT ALL	SLIGHTLY	SOME-WHAT	QUITE A BIT	OVERWHE-LMINGLY
4. Have you had trouble accepting the loss?	O	O	O	O	O
5. Do you feel bitter over your loss?	O	O	O	O	O
6. Do you feel that moving on (e.g., making new friends, pursuing new interests) would be difficult for you now?	O	O	O	O	O
7. Do you feel that life is unfulfilling, empty, or meaningless since your loss?	O	O	O	O	O

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Behavioural Traits

Please shade the circle which best describes your feelings **RIGHT NOW**.

	I feel like gambling:	
not at all	OOOOOOOOOOOOOOOOOOOOOOOOO	very much
	I am driving and the light turns yellow. I feel like:	
stopping	OOOOOOOOOOOOOOOOOOOOOOOOO	accelerating
	The lights suddenly go out in an unfamiliar stairwell:	
I don't move	OOOOOOOOOOOOOOOOOOOOOOOOO	I proceed immediately
	I feel like:	
avoiding everyone	OOOOOOOOOOOOOOOOOOOOOOOOO	taking on the world
	I feel like diving from a diving board, which is:	
very high	OOOOOOOOOOOOOOOOOOOOOOOOO	very low
	I like:	
routine	OOOOOOOOOOOOOOOOOOOOOOOOO	adventure
	I seek:	
the thrill of danger	OOOOOOOOOOOOOOOOOOOOOOOOO	tranquillity
	I am in a hurry:	
I take a dangerous shortcut	OOOOOOOOOOOOOOOOOOOOOOOOO	I take a safe detour
	I am open to:	
negotiation	OOOOOOOOOOOOOOOOOOOOOOOOO	confrontation
	I prefer to:	
direct	OOOOOOOOOOOOOOOOOOOOOOOOO	be supervised
	I give priority to:	
reason	OOOOOOOOOOOOOOOOOOOOOOOOO	action
	I like to listen to music:	
at a loud volume	OOOOOOOOOOOOOOOOOOOOOOOOO	very softly
	I am sure of myself:	
not at all	OOOOOOOOOOOOOOOOOOOOOOOOO	completely
	I prefer discussions, which are:	
animated	OOOOOOOOOOOOOOOOOOOOOOOOO	calm
	A hostile situation:	
weakens me	OOOOOOOOOOOOOOOOOOOOOOOOO	reinforces me

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Behavioural Traits

Please shade the circle which best describes your feelings **RIGHT NOW**.

A menacing dog approaches:

I confront it ○○○○○○○○○○○○○○○○○○○○○○○○○ I run away

Faced with a potentially dangerous event:

I take my time ○○○○○○○○○○○○○○○○○○○○○○○○○ I instantly react

Seeing a person who is drowning, I first:

dive in ○○○○○○○○○○○○○○○○○○○○○○○○○ call for help

I prefer work that is:

well planned ○○○○○○○○○○○○○○○○○○○○○○○○○ not planned

I am right:

all the time ○○○○○○○○○○○○○○○○○○○○○○○○○ never

I emphasize:

precision ○○○○○○○○○○○○○○○○○○○○○○○○○ speed

I like to drive:

very fast ○○○○○○○○○○○○○○○○○○○○○○○○○ very slow

I like to listen to music with a tempo:

very slow ○○○○○○○○○○○○○○○○○○○○○○○○○ very fast

I like to take risks:

not at all ○○○○○○○○○○○○○○○○○○○○○○○○○ a lot

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Child Strength and Difficulties

Please answer all questions in the following section in relation to your oldest child in your custody who is between the ages of 4 and 10.

Child's First Name:

Child's Surname:

Child's DOB: / /

Child's Sex: O Male O Female

Child's Birth Order (e.g. first child = 1, second child = 2):

Instructions: For each item, please mark the box for Not True, Somewhat True or Certainly True. It would help us if you answered all items as best you can even if you are not absolutely certain. Please give your answers on the basis of your child's behaviour **over the last six months.**

	NOT TRUE	SOMEWHAT TRUE	CERTAINLY TRUE
1. Considerate of other people's feelings	O	O	O
2. Restless, overactive, cannot stay still for long	O	O	O
3. Often complains of headaches, stomach-aches or sickness	O	O	O
4. Shares readily with other children, for example toys, treats, pencils	O	O	O
5. Often loses temper	O	O	O
6. Rather solitary, prefers to play alone	O	O	O
7. Generally well behaved, usually does what adults request	O	O	O
8. Many worries or often seems worried	O	O	O
9. Helpful if someone is hurt, upset or feeling ill	O	O	O
10. Constantly fidgeting or squirming	O	O	O
11. Has at least one good friend	O	O	O
12. Often fights with other children or bullies them	O	O	O
13. Often unhappy, depressed or tearful	O	O	O
14. Generally liked by other children	O	O	O
15. Easily distracted, concentration wanders	O	O	O
16. Nervous or clingy in new situations, easily loses confidence	O	O	O
17. Kind to younger children	O	O	O
18. Often lies or cheats	O	O	O
19. Picked on or bullied by other children	O	O	O

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Child Strength and Difficulties

	NOT TRUE	SOMEWHAT TRUE	CERTAINLY TRUE
20. Often volunteers to help others (parents, teachers, other children)	O	O	O
21. Thinks things out before acting	O	O	O
22. Steals from home, school or elsewhere	O	O	O
23. Gets along better with adults than with other children	O	O	O
24. Many fears, easily scared	O	O	O
25. Good attention span, sees chores or homework through to the end	O	O	O

Over the last six months, have your child's teachers complained of:

	NO	A LITTLE	A LOT
26. Fidgetiness, restlessness or overactivity	O	O	O
27. Poor concentration or being easily distracted	O	O	O
28. Acting without thinking, frequently butting in, or not waiting for his or her turn	O	O	O

	NO	YES - MINOR DIFFICULTIES	YES - DEFINITE DIFFICULTIES	YES - SEVERE DIFFICULTIES
29. Overall, do you think that your child has difficulties in any of the following areas: emotions, concentration, behaviour or being able to get along with other people?	O	O	O	O

If you have answered "**Yes**", please answer the following questions about these difficulties:

30. How long have these difficulties been present? O Less than a month O 1-5 months O 6-12 months O Over a year

	NOT AT ALL	A LITTLE	A MEDIUM AMOUNT	A GREAT DEAL
31. Do the difficulties upset or distress your child?	O	O	O	O
Do the difficulties interfere with your child's everyday life in the following areas?				
32. Home life	O	O	O	O
33. Friendships	O	O	O	O
34. Classroom learning	O	O	O	O
35. Leisure activities	O	O	O	O
36. Do the difficulties put a burden on you or the family as a whole?	O	O	O	O

You have now reached the end of the questionnaire!

Thank you for your time and effort in completing this questionnaire.

9.6. IVS participant follow-up letter

DATE

NAME

ADDRESS

ADDRESS

Dear

Thank-you for your ongoing involvement in our research "Mental Health following Injury: The Injury Vulnerability Study". As you may remember, this project aims to identify the difficulties (especially emotional) that individuals may experience following physical injury and to identify those who may be at risk of developing these difficulties.

It will soon be 12 months since you were admitted to the Royal Adelaide Hospital. One of our research officers will thus be ringing you for your twelve-month follow-up interview.

In order to keep this interview as short as possible, I have enclosed a questionnaire that you can complete by yourself and send back in the reply-paid envelope. I understand that completing the questionnaire is time consuming, but it is very important in helping us define the best possible care for future people who, like yourself, suffer serious physical injury. Completion of this questionnaire is important even if you have not had any psychological difficulties following your injuries. If you could please fill out the date you complete to questionnaire on the first page in the top right hand corner that would also be greatly appreciated.

I have also enclosed two new consent forms for the study. The first form is the same consent form you signed while in hospital but with a minor addition requesting your

permission to access various databases or registries that may contain your health information, such as the Motor Accident Commission and the Royal Adelaide Hospital Trauma Registry. Access to this information is important as it allows us to better understand the nature and extent of your injuries. The second consent form requests your permission to gain information on your health care utilisation over a two-year period from the date of your accident. This is to establish your pattern of interaction with the health care system during the period in which you are involved in our research.

We would appreciate it if you could sign and return these consent forms along with your questionnaire booklet.

One of our research officers will be ringing you in the week beginning **insert date** and we would appreciate the questionnaire back to us by this time.

Should you have any questions, please do not hesitate to contact Miranda Van Hooff (Study Manager, Injury Vulnerability Study (08) 8222 5141.

Thank-you again for your participation in this important study.

Kind regards,

Nadia Del Col

Trauma Research Officer

9.7. IVS Clinician Administered PTSD Scale (CAPS)

ID ☐☐☐☐ · ☐☐☐

Three Months CAPS

"I'm going to ask you about symptoms that you may have experienced in the past month. For each symptom I want to find out if you experienced it, and if so, about how often you've experienced it since <the event >. Then for each symptom that you've experienced, I want to find out how strong it was. Please keep your answers short and to the point. If I'm not sure I understand a problem you may be having, I will ask you more about it until I am sure."

Criterion B. The traumatic event is persistently re-experienced in one (or more) of the following ways:

1. (B-1) recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions. **Note:** In young children, repetitive play may occur in which themes or aspects of the trauma are expressed.

In the past month:

Frequency	***Intensity***
Have you had unwanted memories of (EVENT)? (Have you kept remembering the accident even when you have not wanted to?), (Did thoughts about it come to you suddenly when you didn't want them to?) **What were they like?** *(What did you remember?)* [IF NOT CLEAR:] *(Did they ever occur while you were awake, or only in dreams?)* [EXCLUDE IF MEMORIES OCCURRED ONLY DURING DREAMS] **How often have you had these memories in the past month?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much distress or discomfort did these memories cause you? Were you able to put them out of your mind and think about something else?** *(How hard did you have to try?)* **How much did they interfere with your life?** 0 None 1 Mild, minimal distress or disruption of activities 2 Moderate, distress clearly present but still manageable, some disruption of activities 3 Severe, considerable distress, difficulty dismissing memories, marked disruption of activities 4 Extreme, incapacitating distress, cannot dismiss memories, unable to continue activities ***QV (specify)*** _____

(B-2) recurrent distressing dreams of the event. **Note:** In children, there may be frightening dreams without recognizable content.

Frequency	***Intensity***
Have you had unpleasant dreams about (EVENT)? Describe a typical dream. *(What happens in them?)* **How often have you had these dreams in the past month?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much distress or discomfort did these dreams cause you? Did they ever wake you up?** [IF YES:] *(What happened when you woke up? How long did it take you to get back to sleep?)* [LISTEN FOR REPORT OF ANXIOUS AROUSAL, YELLING, ACTING OUT THE NIGHTMARE] *(Did your dreams ever affect anyone else? How so?)* 0 None 1 Mild, minimal distress, may not have awoken 2 Moderate, awoke in distress but readily returned to sleep 3 Severe, considerable distress, difficulty returning to sleep 4 Extreme, incapacitating distress, did not return to sleep ***QV (specify)*** _____

3. (B-3) acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated). **Note:** In young children, trauma-specific reenactment may occur.

Frequency	***Intensity***
Have you suddenly acted or felt as if (EVENT) were happening again? *(Have you ever had flashbacks about [EVENT]?)* [IF NOT CLEAR:] *(Did this ever occur while you were awake, or only in dreams?)* [EXCLUDE IF OCCURRED ONLY DURING DREAMS] **Tell me more about that. How often has that happened in the past month?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much did it seem as if (EVENT) were happening again?** *(Were you confused about where you actually were or what you were doing at the time?)* **How long did it last? What did you do while this was happening?** *(Did other people notice your behavior? What did they say?)* 0 No reliving 1 Mild, somewhat more realistic than just thinking about event 2 Moderate, definite but transient dissociative quality, still very aware of surroundings, daydreaming quality 3 Severe, strongly dissociative (reports images, sounds, or smells) but retained some awareness of surroundings 4 Extreme, complete dissociation (flashback), no awareness of surroundings, may be unresponsive, possible amnesia for the episode (blackout) ***QV (specify)*** _____

4. (B-4) intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event

Frequency	***Intensity***
Have you gotten emotionally upset when something reminded you of (EVENT)? *(Has anything ever triggered bad feelings related to [EVENT]?)* **What kinds of reminders made you upset? How often in the past month?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much distress or discomfort did (REMINDERS) cause you? How long did it last? How much did it interfere with your life?** 0 None 1 Mild, minimal distress or disruption of activities 2 Moderate, distress clearly present but still manageable, some disruption of activities 3 Severe, considerable distress, marked disruption of activities 4 Extreme, incapacitating distress, unable to continue activities ***QV (specify)*** _____

5. (B-5) physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event

Frequency	***Intensity***
Have you had any physical reactions when something reminded you of (EVENT)? *(Did your body ever react in some way when something reminded you of [EVENT]?)* **Can you give me some examples?** *(Did your heart race or did your breathing change? What about sweating or feeling really tense or shaky?)* **What kinds of reminders triggered these reactions? How often in the past month?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day If daily 5 Once or twice a day 6 Several times a day 7 Many times a day/ constantly ***Description/Examples***	**How strong were (PHYSICAL REACTIONS)? How long did they last?** *(Did they last even after you were out of the situation?)* 0 No physical reactivity 1 Mild, minimal reactivity 2 Moderate, physical reactivity clearly present, may be sustained if exposure continues 3 Severe, marked physical reactivity, sustained throughout exposure 4 Extreme, dramatic physical reactivity, sustained arousal even after exposure has ended ***QV (specify)*** _____

Criterion C. Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by three (or more) of the following:

6. (C-1) efforts to avoid thoughts, feelings, or conversations associated with the trauma

Frequency	***Intensity***
Have you tried to avoid thoughts or feelings about (EVENT)? *(What kinds of thoughts or feelings did you try to avoid?)* **What about trying to avoid talking with other people about it?** *(Why is that?)* **How often in the past month?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much effort did you make to avoid (THOUGHTS/FEELINGS/CONVERSATIONS)?** *(What kinds of things did you do? What about drinking or using medication or street drugs?)* [CONSIDER ALL ATTEMPTS AT AVOIDANCE, INCLUDING DISTRACTION, SUPPRESSION, AND USE OF ALCOHOL/DRUGS] **How much did that interfere with your life?** 0 None 1 Mild, minimal effort, little or no disruption of activities 2 Moderate, some effort, avoidance definitely present, some disruption of activities 3 Severe, considerable effort, marked avoidance, marked disruption of activities, or involvement in certain activities as avoidant strategy 4 Extreme, drastic attempts at avoidance, unable to continue activities, or excessive involvement in certain activities as avoidant strategy ***QV (specify)*** _____

7. (C-2) efforts to avoid activities, places, or people that arouse recollections of the trauma

Frequency	***Intensity***
Have you tried to avoid certain activities, places, or people that reminded you of (EVENT)? *(What kinds of things did you avoid? Why is that?)* **How often in the past month?** 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How much effort did you make to avoid (ACTIVITIES/PLACES/PEOPLE)?** *(What did you do instead?)* **How much did that interfere with your life?** 0 None 1 Mild, minimal effort, little or no disruption of activities 2 Moderate, some effort, avoidance definitely present, some disruption of activities 3 Severe, considerable effort, marked avoidance, marked disruption of activities or involvement in certain activities as avoidant strategy 4 Extreme, drastic attempts at avoidance, unable to continue activities, or excessive involvement in certain activities as avoidant strategy ***QV (specify)*** _____

8. (C-3) inability to recall an important aspect of the trauma

Frequency	***Intensity***
Have you had difficulty remembering some important parts of (EVENT)? Tell me more about that. *(Do you feel you should be able to remember these things? Why do you think you can't?)* **In the past month, how much of the important parts of (EVENT) have you had difficulty remembering?** *(What parts do you still remember?)* 0 None, clear memory 1 Few aspects not remembered (less than 10%) 2 Some aspects not remembered (approx 20-30%) 3 Many aspects not remembered (approx 50-60%) 4 Most or all aspects not remembered (more than 80%) ***Description/Examples***	**How much difficulty did you have recalling important parts of (EVENT)?** *(Were you able to recall more if you tried?)* 0 None 1 Mild, minimal difficulty 2 Moderate, some difficulty, could recall with effort 3 Severe, considerable difficulty, even with effort 4 Extreme, completely unable to recall important aspects of event ***QV (specify)*** _____

9. (C-4) markedly diminished interest or participation in significant activities

Frequency	***Intensity***
Have you been less interested in activities that you used to enjoy? *(What kinds of things have you lost interest in? Are there some things you don't do at all anymore? Why is that?)* [EXCLUDE IF NO OPPORTUNITY, IF PHYSICALLY UNABLE, OR IF DEVELOPMENTALLY APPROPRIATE CHANGE IN PREFERRED ACTIVITIES] **In the past month, how many activities have you been less interested in?** *(What kinds of things do you still enjoy doing?)* **When did you first start to feel that way?** *(After the [EVENT]?)* 0 None 1 Few activities (less than 10%) 2 Some activities (approx 20-30%) 3 Many activities (approx 50-60%) 4 Most or all activities (more than 80%) ***Description/Examples***	**How strong was your loss of interest?** *(Would you enjoy [ACTIVITIES] once you got started?)* 0 No loss of interest 1 Mild, slight loss of interest, probably would enjoy after starting activities 2 Moderate, definite loss of interest, but still has some enjoyment of activities 3 Severe, marked loss of interest in activities 4 Extreme, complete loss of interest, no longer participates in any activities ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

10. (C-5) feeling of detachment or estrangement from others

Frequency	***Intensity***
Have you felt distant or cut off from other people? What was that like? How much of the time in the past month have you felt that way? When did you first start to feel that way? *(After the [EVENT]?)* 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How strong were your feelings of being distant or cut off from others?** *(Who do you feel closest to? How many people do you feel comfortable talking with about personal things?)* 0 No feelings of detachment or estrangement 1 Mild, may feel "out of synch" with others 2 Moderate, feelings of detachment clearly present, but still feels some interpersonal connection 3 Severe, marked feelings of detachment or estrangement from most people, may feel close to only one or two people 4 Extreme, feels completely detached or estranged from others, not close with anyone ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

11. (C-6) restricted range of affect (e.g., unable to have loving feelings)

Frequency	***Intensity***
Have there been times when you felt emotionally numb or had trouble experiencing feelings like love or happiness? What was that like? *(What feelings did you have trouble experiencing?)* **How much of the time in the past month have you felt that way? When did you first start having trouble experiencing (EMOTIONS)?** *(After the [EVENT]?)* 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How much trouble did you have experiencing (EMOTIONS)?** *(What kinds of feelings were you still able to experience?)* [INCLUDE OBSERVATIONS OF RANGE OF AFFECT DURING INTERVIEW] 0 No reduction of emotional experience 1 Mild, slight reduction of emotional experience 2 Moderate, definite reduction of emotional experience, but still able to experience most emotions 3 Severe, marked reduction of experience of at least two primary emotions (e.g., love, happiness) 4 Extreme, completely lacking emotional experience ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

12. (C-7) sense of a foreshortened future (e.g., does not expect to have a career, marriage, children, or a normal life span)

Frequency	***Intensity***
Have there been times when you felt there is no need to plan for the future, that somehow your future will be cut short? Why is that? [RULE OUT REALISTIC RISKS SUCH AS LIFE-THREATENING MEDICAL CONDITIONS] **How much of the time in the past month have you felt that way? When did you first start to feel that way?** *(After the [EVENT]?)* 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How strong was this feeling that your future will be cut short?** *(How long do you think you will live? How convinced are you that you will die prematurely?)* 0 No sense of a foreshortened future 1 Mild, slight sense of a foreshortened future 2 Moderate, sense of a foreshortened future definitely present, but no specific prediction about longevity 3 Severe, marked sense of a foreshortened future, may make specific prediction about longevity 4 Extreme, overwhelming sense of a foreshortened future, completely convinced of premature death ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

Criterion D. Persistent symptoms of increased arousal (not present before the trauma), as indicated by two (or more) of the following:

13. (D-1) difficulty falling or staying asleep

Frequency	***Intensity***
Have you had any problems falling or staying asleep? How often in the past month? When did you first start having problems sleeping? *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day Sleep onset problems? Y N Mid-sleep awakening? Y N Early a.m. awakening? Y N Total # hrs sleep/night _____ Desired # hrs sleep/night _____	**How much of a problem did you have with your sleep?** *(How long did it take you to fall asleep? How often did you wake up in the night? Did you often wake up earlier than you wanted to? How many total hours did you sleep each night?)* 0 No sleep problems 1 Mild, slightly longer latency, or minimal difficulty staying asleep (up to 30 minutes loss of sleep) 2 Moderate, definite sleep disturbance, clearly longer latency, or clear difficulty staying asleep (30-90 minutes loss of sleep) 3 Severe, much longer latency, or marked difficulty staying asleep (90 min to 3 hrs loss of sleep) 4 Extreme, very long latency, or profound difficulty staying asleep (> 3 hrs loss of sleep) ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

14. (D-2) irritability or outbursts of anger

Frequency	***Intensity***
Have there been times when you felt especially irritable or showed strong feelings of anger? Can you give me some examples? How often in the past month? When did you first start feeling that way? *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How strong was your anger?** *(How did you show it?)* [IF REPORTS SUPPRESSION:] *(How hard was it for you to keep from showing your anger?)* **How long did it take you to calm down? Did your anger cause you any problems?** 0 No irritability or anger 1 Mild, minimal irritability, may raise voice when angry 2 Moderate, definite irritability or attempts to suppress anger, but can recover quickly 3 Severe, marked irritability or marked attempts to suppress anger, may become verbally or physically aggressive when angry 4 Extreme, pervasive anger or drastic attempts to suppress anger, may have episodes of physical violence ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

15. (D-3) difficulty concentrating

Frequency	***Intensity***
Have you found it difficult to concentrate on what you were doing or on things going on around you? What was that like? How much of the time in the past month? When did you first start having trouble concentrating? *(After the [EVENT]?)* 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How difficult was it for you to concentrate?** [INCLUDE OBSERVATIONS OF CONCENTRATION AND ATTENTION IN INTERVIEW] **How much did that interfere with your life?** 0 No difficulty with concentration 1 Mild, only slight effort needed to concentrate, little or no disruption of activities 2 Moderate, definite loss of concentration but could concentrate with effort, some disruption of activities 3 Severe, marked loss of concentration even with effort, marked disruption of activities 4 Extreme, complete inability to concentrate, unable to engage in activities ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

16. (D-4) hypervigilance

Frequency	***Intensity***
Have you been especially alert or watchful, even when there was no real need to be? *(Have you felt as if you were constantly on guard?)* **Why is that? How much of the time in the past month? When did you first start acting that way?** *(After the [EVENT]?)* 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How hard did you try to be watchful of things going on around you?** [INCLUDE OBSERVATIONS OF HYPERVIGILANCE IN INTERVIEW] **Did your (HYPERVIGILANCE) cause you any problems?** 0 No hypervigilance 1 Mild, minimal hypervigilance, slight heightening of awareness 2 Moderate, hypervigilance clearly present, watchful in public (e.g., chooses safe place to sit in a restaurant or movie theater) 3 Severe, marked hypervigilance, very alert, scans environment for danger, exaggerated concern for safety of self/family/home 4 Extreme, excessive hypervigilance, efforts to ensure safety consume significant time and energy and may involve extensive safety/checking behaviors, marked watchfulness during interview ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

17. (D-5) exaggerated startle response

Frequency	***Intensity***
Have you had any strong startle reactions? When did that happen? *(What kinds of things made you startle?)* **How often in the past month? When did you first have these reactions?** *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How strong were these startle reactions?** *(How strong were they compared to how most people would respond?)* **How long did they last?** 0 No startle reaction 1 Mild, minimal reaction 2 Moderate, definite startle reaction, feels "jumpy" 3 Severe, marked startle reaction, sustained arousal following initial reaction 4 Extreme, excessive startle reaction, overt coping behavior (e.g., combat veteran who "hits the dirt") ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

Associated Features

26. guilt over acts of commission or omission

Frequency	***Intensity***
Have you felt guilty about anything you did or didn't do during (EVENT)? Tell me more about that. *(What do you feel guilty about?)* **How much of the time have you felt that way in the past month ?** 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) ***Description/Examples***	**How strong were these feelings of guilt? How much distress or discomfort did they cause?** 0 No feelings of guilt 1 Mild, slight feelings of guilt 2 Moderate, guilt feelings definitely present, some distress but still manageable 3 Severe, marked feelings of guilt, considerable distress 4 Extreme, pervasive feelings of guilt, self-condemnation regarding behavior, incapacitating distress ***QV (specify)*** _____

27. survivor guilt [APPLICABLE ONLY IF MULTIPLE VICTIMS]

Frequency	***Intensity***
Have you felt guilty about surviving (EVENT) when others did not? Tell me more about that. *(What do you feel guilty about?)* **How much of the time have you felt that way in the past month?** 0 None of the time 1 Very little of the time (less than 10%) 2 Some of the time (approx 20-30%) 3 Much of the time (approx 50-60%) 4 Most or all of the time (more than 80%) 8 N/A ***Description/Examples***	**How strong were these feelings of guilt? How much distress or discomfort did they cause?** 0 No feelings of guilt 1 Mild, slight feelings of guilt 2 Moderate, guilt feelings definitely present, some distress but still manageable 3 Severe, marked feelings of guilt, considerable distress 4 Extreme, pervasive feelings of guilt, self-condemnation regarding survival, incapacitating distress ***QV (specify)*** _____

28. a reduction in awareness of his or her surroundings (e.g., "being in a daze")

Frequency	***Intensity***
Have there been times when you felt out of touch with things going on around you, like you were in a daze? What was that like? [DISTINGUISH FROM FLASHBACK EPISODES] **How often has that happened in the past month?** [IF NOT CLEAR:] *(Was it due to an illness or the effects of drugs or alcohol?)* **When did you first start feeling that way?** *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How strong was this feeling of being out of touch or in a daze?** *(Were you confused about where you actually were or what you were doing at the time?)* **How long did it last? What did you do while this was happening?** *(Did other people notice your behavior? What did they say?)* 0 No reduction in awareness 1 Mild, slight reduction in awareness 2 Moderate, definite but transient reduction in awareness, may report feeling "spacy" 3 Severe, marked reduction in awareness, may persist for several hours 4 Extreme, complete loss of awareness of surroundings, may be unresponsive, possible amnesia for the episode (blackout) ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

29. derealization

Frequency	***Intensity***
Have there been times when things going on around you seemed unreal or very strange and unfamiliar? [IF NO:] *(What about times when people you knew suddenly seemed unfamiliar?)* **What was that like? How often has that happened in the past month?** [IF NOT CLEAR:] *(Was it due to an illness or the effects of drugs or alcohol?)* **When did you first start feeling that way?** *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How strong was (DEREALIZATION)? How long did it last? What did you do while this was happening?** *(Did other people notice your behavior? What did they say?)* 0 No derealization 1 Mild, slight derealization 2 Moderate, definite but transient derealization 3 Severe, considerable derealization, marked confusion about what is real, may persist for several hours 4 Extreme, profound derealization, dramatic loss of sense of reality or familiarity ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

30. depersonalization

Frequency	***Intensity***
Have there been times when you felt as if you were outside of your body, watching yourself as if you were another person? [IF NO:] *(What about times when your body felt strange or unfamiliar to you, as if it had changed in some way?)* **What was that like? How often has that happened in the past month ?** [IF NOT CLEAR:] *(Was it due to an illness or the effects of drugs or alcohol?)* **When did you first start feeling that way?** *(After the [EVENT]?)* 0 Never 1 Once or twice 2 Once or twice a week 3 Several times a week 4 Daily or almost every day ***Description/Examples***	**How strong was (DEPERSONALIZATION)? How long did it last? What did you do while this was happening?** *(Did other people notice your behavior? What did they say?)* 0 No depersonalization 1 Mild, slight depersonalization 2 Moderate, definite but transient depersonalization 3 Severe, considerable depersonalization, marked sense of detachment from self, may persist for several hours 4 Extreme, profound depersonalization, dramatic sense of detachment from self ***QV (specify)*** _____ ***Trauma-related?*** *1 definite 2 probable 3 unlikely*

Criterion E. Duration of the disturbance (symptoms in Criteria B, C, and D) is more than 1 month.

18. onset of symptoms

[IF NOT ALREADY CLEAR:] **When did you first start having (PTSD SYMPTOMS) you've told me about?** *(How long after the trauma did they start? More than six months?)*	_____ ***total # months delay in onset*** ***With delayed onset (≥ 6 months)?*** ***NO YES***

19. duration of symptoms

		Current
[CURRENT] **How long have these (PTSD SYMPTOMS) lasted altogether?**	*Duration two days or more?*	***NO YES***
	Duration more than 1 month?	***NO YES***
	Total # months duration	_____
	Acute (< 3 months) or chronic (≥ 3 months)?	***acute chronic***

Criterion F. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

20. subjective distress

[CURRENT] **Overall, how much have you been bothered by these (PTSD SYMPTOMS) you've told me about?** [CONSIDER DISTRESS REPORTED ON EARLIER ITEMS]	0 None 1 Mild, minimal distress 2 Moderate, distress clearly present but still manageable 3 Severe, considerable distress 4 Extreme, incapacitating distress

21. impairment in social functioning

[CURRENT] **Have these (PTSD SYMPTOMS) affected your relationships with other people? How so?** [CONSIDER IMPAIRMENT IN SOCIAL FUNCTIONING REPORTED ON EARLIER ITEMS]	0 No adverse impact 1 Mild impact, minimal impairment in social functioning 2 Moderate impact, definite impairment, but many aspects of social functioning still intact 3 Severe impact, marked impairment, few aspects of social functioning still intact 4 Extreme impact, little or no social functioning

22. impairment in occupational or other important area of functioning

[CURRENT – IF NOT ALREADY CLEAR] **Are you working now?** IF YES: **Have these (PTSD SYMPTOMS) affected your work or your ability to work? How so?** [CONSIDER REPORTED WORK HISTORY, INCLUDING NUMBER AND DURATION OF JOBS, AS WELL AS THE QUALITY OF WORK RELATIONSHIPS. IF PREMORBID FUNCTIONING IS UNCLEAR, INQUIRE ABOUT WORK EXPERIENCES BEFORE THE TRAUMA. FOR CHILD/ADOLESCENT TRAUMAS, ASSESS PRE-TRAUMA SCHOOL PERFORMANCE AND POSSIBLE PRESENCE OF BEHAVIOR PROBLEMS] IF NO: **Have these (PTSD SYMPTOMS) affected any other important part of your life?** [AS APPROPRIATE, SUGGEST EXAMPLES SUCH AS PARENTING, HOUSEWORK, SCHOOLWORK, VOLUNTEER WORK, ETC.] **How so?** IF NO: **Did these (PTSD SYMPTOMS) affect any other important part of your life?** [AS APPROPRIATE, SUGGEST EXAMPLES SUCH AS PARENTING, HOUSEWORK, SCHOOLWORK, VOLUNTEER WORK, ETC.] **How so?**	0 No adverse impact 1 Mild impact, minimal impairment in occupational/other important functioning 2 Moderate impact, definite impairment, but many aspects of occupational/other important functioning still intact 3 Severe impact, marked impairment, few aspects of occupational/other important functioning still intact 4 Extreme impact, little or no occupational/other important functioning

Global Ratings

23. global validity

ESTIMATE THE OVERALL VALIDITY OF RESPONSES. CONSIDER FACTORS SUCH AS COMPLIANCE WITH THE INTERVIEW, MENTAL STATUS (E.G., PROBLEMS WITH CONCENTRATION, COMPREHENSION OF ITEMS, DISSOCIATION), AND EVIDENCE OF EFFORTS TO EXAGGERATE OR MINIMIZE SYMPTOMS.	0 Excellent, no reason to suspect invalid responses 1 Good, factors present that may adversely affect validity 2 Fair, factors present that definitely reduce validity 3 Poor, substantially reduced validity 4 Invalid responses, severely impaired mental status or possible deliberate "faking bad" or "faking good"

24. global severity

ESTIMATE THE OVERALL SEVERITY OF PTSD SYMPTOMS. CONSIDER DEGREE OF SUBJECTIVE DISTRESS, DEGREE OF FUNCTIONAL IMPAIRMENT, OBSERVATIONS OF BEHAVIORS IN INTERVIEW, AND JUDGMENT REGARDING REPORTING STYLE.	0 No clinically significant symptoms, no distress and no functional impairment 1 Mild, minimal distress or functional impairment 2 Moderate, definite distress or functional impairment but functions satisfactorily with effort 3 Severe, considerable distress or functional impairment, limited functioning even with effort 4 Extreme, marked distress or marked impairment in two or more major areas of functioning