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A quantitative investigation of complex post-traumatic stress disorder among military veterans in Northern Ireland

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A Quantitative Investigation of Complex Post-Traumatic Stress Disorder Among Military Veterans in Northern Ireland

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Abstract

The study of traumatic stress is of great importance within the military veteran population given the unique risk to this group of exposure to stressful events. Understanding is historically drawn from the examination of Post-Traumatic Stress Disorder (PTSD) among this group, however recent developments have presented a diverse range of potential post-traumatic syndromes that may likewise apply. One such construct is that of Complex PTSD (C-PTSD); which describes a range of difficulties beyond that traditionally recognised and typically arising from repeated or cumulative stressful experiences. This diagnosis has gained significant interest and is recently included in the 11th Edition of the International Classification of Diseases (ICD-11).

Given the potential for unique traumatic experiences among the military veteran group in Northern Ireland (NI) arising from contextual factors such as the legacy of political conflict in the region and a heightened perceived threat to personal safety, the emerging diagnostic concept of C-PTSD was considered a pertinent line of enquiry. As this thesis presents the first empirical investigation of this concept within the target population it was deemed important to validate the concept and measurement of C-PTSD in this group, in addition to examining patterns of morbidity associated with symptoms and with other psychopathological disorders.

Data were collected from a community sample of military veterans living in NI via distribution of a quantitative health and well-being survey. The goals of this thesis were accomplished through the development of a validated method of data collection and measurement of symptomology (*Chapter 2*), validation of the currently recognised criteria for C-PTSD using factor analysis and evaluation of discriminant diagnostic criteria (*Chapters 3 & 4*). Subsequent studies applied latent variable modelling and regression to understand symptomology of C-PTSD (*Chapter 5*), traumatic experiences as predictors (*Chapter 6*), and its associated comorbidities (*Chapter 7*).

The results of the empirical investigations confirmed the construct and discriminant validity of C-PTSD in the study population; supporting the decision to proceed to

more elaborate analyses. The application of Latent Profile Analysis to symptoms of C-PTSD revealed Moderate and High Symptomatic classes, suggesting C-PTSD pathology to be prevalent in the study population and sub-groups to be varied uniformly by severity. Examination of predictors of C-PTSD, consistent with expectations, demonstrated childhood and cumulative lifetime trauma and adversity to predict High C-PTSD group membership. Many predictors expected to predict C-PTSD; e.g. interpersonal assaultive trauma, were found not to significantly predict C-PTSD, while serving in NI was found to be associated with an increased risk of C-PTSD. These results highlight the relevance of population characteristics as risk factors for C-PTSD. Finally, results of regression and Latent Class Analysis of C-PTSD and common psychiatric disorders indicated that alike traditional PTSD, C-PTSD appears to be a highly comorbid condition associated with increased risk of multiple psychopathological disorders.

The results of this investigation provide a substantive and unique contribution to the growing body of literature concerning this emerging C-PTSD classification, and support its relevance to the NI military veteran population. Specific implications and recommendations arising from these findings are presented throughout and summarised in *Chapter 8*.

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Glossary of Terms and Abbreviations

Term	*Definition/Expansion*
ACE	Adverse Childhood Experiences
AFC	Armed Forces Covenant
APA	American Psychiatric Association
APMS	Adult Psychiatric Morbidity Survey
ATSPPH	Attitudes Toward Seeking Psychological Professional Help-Short Form
AUDIT	Alcohol Use Disorder Identification Test
BBC	British Broadcasting Corporation
BBGS	Brief Biosocial Gambling Scale
Caseness	Meeting diagnostic requirements for established or standardised criteria
CBT	Cognitive Behavioural Therapy
CD-RISC	Conor-Davidson Resilience Scale
CES	Combat Exposure Scale
CMD	Common Mental (Health) Disorder
C-PTSD	Complex Post-Traumatic Stress Disorder
DAR-7	Dimensions of Anger Reactions Scale (7 items)
DAST	Drug Abuse Screening Test
DESNOS	Disorders of Extreme Stress Not Otherwise Specified
D-PTSD	Dissociative PTSD
DSM	Diagnostic and Statistical Manuel
DSO	Disturbances in Self Organisation
DSS	Dissociative Symptoms Scale
ERA	Expectations Regarding Aging Survey
FMM	Factor Mixture Model
GAD	Generalised Anxiety Disorder
IC	Information Criterion
ICD	International Classification of Diseases
IPV	Intimate Partner Violence
ITQ	International Trauma Questionnaire
LCA	Latent Class Analysis
LPA	Latent Profile Analysis
M2C-Q	Military to Civilian Life Questionnaire
MCAR	Missing Completely at Random
MDD	Major Depressive Disorder
NESARC	National Epidemiological Survey of Alcohol and Related Conditions
NI	Northern Ireland
NISRA	Northern Ireland Statistics and Research Agency
NIVHWS	Northern Ireland Veterans' Health and Wellbeing Study
OR	Odds Ratio
PCL-5	PTSD Checklist for DSM-5
PHQ-9	Patient Health Questionnaire (9 items)
PSNI	Police Service of Northern Ireland

Term	*Definition/Expansion*
PSQI	Pittsburgh Sleep Quality Index
PTGI-SF	Post-Traumatic Growth Inventory Short Form
PTSD	Post-Traumatic Stress Disorder
Poly-morbid	Experience of multiple conditions concurrently
RIR	Royal Irish Regiment
RQ	Relationship Questionnaire
SD	Standard Deviation
SEM	Structural Equational Modelling
SLESQ	Stressful Life Events Screening Questionnaire
Suicidality	Suicidal ideation and attempt
UDR	Ulster Defence Regiment
UK	United Kingdom
UREC	(Ulster) University Research Ethics Committee
US	United States (of America)
VA	Veterans Affairs
VR-12	Veterans Rand health survey (12 items)
WHO	World Health Organisation
WHO-WMHS	World Health Organisation's World Mental Health Survey
WMH-ICS	WHO Mental Health International College Student Project

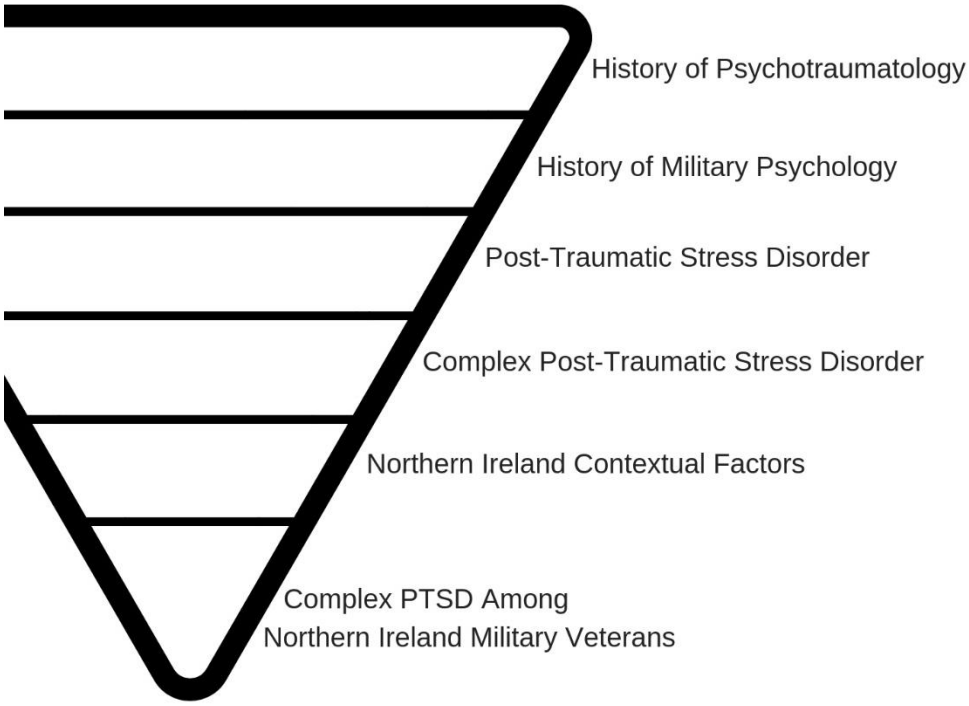
Chapter 1.0;

The Mental Health of Military Veterans Living in Northern Ireland

1.1 Theoretical Framework

This chapter introduces the background to the research beginning broadly with the field of psychotraumatology and the study of Post-Traumatic Stress Disorder (PTSD) through diagnostic classification. *Figure 1.1* below depicts the theoretical framework of this thesis and its introductory chapter. This is represented through a drill-down of topics beginning with the broadest disciplinary background, leading to the more specific topics and research aims of this investigation.

Figure 1.1; Theoretical Framework and Background to Thesis



The specific concept of Complex PTSD (C-PTSD) is then introduced and a rationale for its examination within the military veteran population in Northern Ireland (NI) is presented with reference to unique contextual factors related to NI. This rationale is then parsed into the overarching research aims of this investigation.

1.2 History of Psychotraumatology

Psychotraumatology is defined as the study of how psychologically stressful or traumatic exposure may influence the mental health and behaviour of the individual and factors associated with this (Everly, 1995). The history of psychotraumatology research and indeed a lot of psychological research is considered to stem from observations of severe mental distress of soldiers [veterans] returning from World War I, a condition then dubbed '*Shell Shock*' or '*Nerve Shock*' (see C. Myers, 1915). Since this the military population has played a salient role in psychological research for a number of years culminating in the foundation of *Military Psychology*, a sub-discipline entirely focused on the application of psychological theory and practice with military personnel and often their families.

The current diagnostic criteria has however been criticised for not fully encapsulating the range of psychological distress experienced by survivors of trauma and the sociocultural implications of their distress and how these manifest for the individual (Tol et al., 2010). Engel (1977) in a seminal piece argued for special consideration to be given to the psychosocial and cultural factors around the expressing of ill-health and disease in the field of medicine, an approach mirrored by that of the biopsychosocial approach to understanding, widely adopted and recognised as the gold standard in psychological and clinical practice (Mc Inerney, 2002).

One such concept of the psychosocial effects of trauma on psychological well-being is so-called '*Social Suffering*' (Kleinman, 1997). This concept describes suffering as a bodily function but also as a social and psychological process. It is therefore argued that each facet warrants consideration in understanding turmoil and stress. Kleinman (1977) argues that suffering at its heart is a function of social and cultural normative beliefs as individuals come to appraise their emotions in light of these influences. Psychological morbidity is therefore understood as a function of social expectations; where behaviour violates expectations being considered aberrant or indicative of mental ill-health. Social Suffering is however limited in that is primarily descriptive of psychological distress, rather than prescriptive. While valuable in theoretical

understanding psychological ill-health in a unidimensional sense there is a need to consider more elaborate theories that account for greater complexity in psychological states as the relate to the environment and others.

This concept is thus extended by an additional theory dubbed "*Idioms-of-Distress*"; defined by Nichter (2010) as the indexing of past traumatic events and current and persistent life stressors such as feelings of powerlessness, marginalisation and anger as well as angst over potential future events. Part of the importance of considering Idioms-of-Distress is argued to once again be the sociocultural reactions, or lack thereof, to the distress one may be experiences and expression of psychological and behavioural problems (Desai & Chaturvedi, 2017; Nichter, 2010). Desai and Chaturvedi (2017) go on to describe the unique influence of society and culture on the expression and understanding of psychopathology, as behaviours and symptoms that diverge from expected norms may be pathologised in one context and not another leading to diagnosis of recognised psychopathologies. This is an important consideration when codifying a novel diagnosis as this should sufficiently capture psychological impairment without pathologising culturally sanctioned beliefs or behaviours. Experience of these Idioms-of-Distress are argued to exist outside of diagnostic criteria and indeed may lead to greater psychological distress and symptomologies within existing diagnostic frameworks (Kienzler & Locke, 2017).

Further to this, a tenet of Idioms-of-Distress is that psychological reactions to stressful stimuli are inherently wide ranging and greatly diverse between individuals (Hinton & Lewis-Fernández, 2010). As such the manifestation of post-traumatic symptomology varies considerably between groups, and may not be seen as problematic or distressing in some cases (Hinton & Lewis-Fernández, 2010). This highlights a key limitation of this theory; once again lacking restricted prescription for psychopathology. It does however highlight the need to reconcile the generalisability of current diagnostic models and to investigate the culture-specific expressions of psychopathology.

Varvin (2018) concurs with this argument, positing that trauma and traumatisation conceptualised as a static event and experiences is inherently flawed. Traumatisation may manifest itself in a variety of ways and be expressed through physical and emotional distress that can be difficult to qualify or to attribute to the experience of trauma. Likewise evidence supports that the experience of traumatic events is widespread and the majority of individuals will experience numerous in their lifetime (Benjet et al., 2016). Such experiences fundamentally change how individuals interact with and respond to their environment and others. Equally, subjective appreciations of trauma may change interpretations of the self and lead to maladaptive thoughts and behaviours (Varvin, 2018). This manifestation of aberrant behaviours and cognitions has prompted consideration of myriad symptoms related to post-traumatic psychopathology for which understanding remains limited. These clinical observations have given rise to the growing empirical consideration of '*Complex Trauma*', stressful events of a chronic or pervasive nature (J. L. Herman, 1992), and the distinct outcomes this may beget (Cloitre et al., 2009).

1.3 History of Military Psychology

There is a long-standing and harmful public perception of returning military veterans as "*mad, bad, or sad*" (UK Defence Committee, 2018, p. 3); i.e. a perception that service personnel experience near universal difficulties regarding their well-being. This finding was replicated in NI with over half the public believing veterans to be at risk for mental ill-health (Armour, Waterhouse-Bradley, Walker, & Ross, 2017). However, some empirical evidence has revealed military veterans experience no greater degree of common mental health disorders than the general population (Hunt, Wessely, Jones, Rona, & Greenberg, 2014). Contrary evidence from a study of occupational health has however shown those in the military are twice as likely than the comparable working population to report common mental disorders (Goodwin et al., 2015). The authors of this study argue that the risk for mental ill-health observed may be a function of predisposing factors concentrated in military populations such as greater reporting of childhood adversity (Goodwin et al., 2015). Likewise due to the unique experience(s) of military veterans, particularly in combat

roles, this group is at risk for experiencing trauma and stressor-related psychopathologies.

Service personnel are more likely to survive such physical traumatic exposures in modernity due to the substantial advances in medical technology and practices (Thompson, 2015). As a result of this many researchers have increasingly examined the '*invisible wounds of war*'; those effects and injuries resulting from exposure to events which impact the psychological health of the returning veteran rather than those injuries with physical manifestations (Tanielian & Jaycox, 2008). Although of great interest in contemporary literature the psychological effects of war on returning service personnel have been mused throughout time with recordings of such thought traceable to ancient Greek literature (see Shay, 2003). Robust empirical study of the psychological effects of psychological trauma and combat exposure however did not begin in earnest until World War I with the advents of concepts such as '*Shell Shock*' and '*Nerve Shock*' (C. Myers, 1915).

These terms were used to describe patterns of symptomatology (e.g. tinnitus, hypersensitivity to noise, nausea, and profound feelings of fear and panic) associated with some combatants returning from theatres of conflict at that time (E. Jones & Wessely, 2006). This approach to understanding traumatic reaction remained largely grounded in biomedical or rudimentary psychiatric understanding attributing the cause of these symptoms exclusively to damage or alteration to the physical brain of the individual (E. Jones & Wessely, 2014). Following many studies showing tenuous neurological links to the pathology described and theoretical expansion the purported causation was expanded to consider '*psychic trauma*' (E. Jones & Wessely, 2014). The development of psychology and psychiatry complimented this paradigm shift and lead to the development of more psychopathological perspectives of traumatic stress among military veterans.

Another salient issue considered for military veterans is the perceived or objective stigma and discrimination in relation to mental ill-health experienced on the part of

the general public and the Armed Forces culture (Greene–Shortridge, Britt, & Castro, 2007). Indeed, the biomedical model of understanding veteran mental health prevailed for so long owing to the stigma surrounding such symptoms and clinical belief in neurological explanations (E. Jones & Wessely, 2005). It is argued that the ability to attribute mental ill-health to physical health conditions allowed service personnel to avoid perceptions of weakness on failed discipline and as such were seen as more acceptable (E. Jones & Wessely, 2014).

As discussed previously, there is reportedly a general sentiment that returning veterans are perceived to be at greater risk of suffering a myriad of psychological problems (Ministry of Defence, 2015). Previous empirical evidence has also found the public perceive veterans with PTSD to display much greater fear, danger/hostility, and anger than those without psychological diagnoses (Caldwell & Lauderdale, 2018). This ill-perception is argued to contribute to an increased risk for adverse mental health outcomes and to act as a barrier to help-seeking (C. Armour, Waterhouse-Bradley, Ross, Mclafferty, & Hall, 2018). This highlights the importance of contemporary research to address mental ill-health within this population.

Focus within literature has thus shifted to better understanding the psychological sequelae of traumatic exposure, both from a biomedical and psychological perspective. This would lead to psychological post-traumatic pathologies/outcomes to be regarded as Combat Stress Reaction [CSR], Acute Stress Disorder [ASD] and most recently Post-Traumatic Stress Disorder [PTSD] (E. Jones & Wessely, 2005). These disorders and dimensional problems were continuously empirically evaluated furthering understanding of the psychological impact of traumatic exposure during wartime conflict. Each conflict has its own ‘war syndrome’ description of myriad psychogenic and psychological symptoms which vary across time but seek to qualify experiences of veteran ill-health (Hyams, 1996; E. Jones & Wessely, 2014).

The inconsistencies between the expression and proposed origins of these conditions highlighted the need for an evidence based clinical approach to understanding post-traumatic psychological problems leading to the advent of psychiatric classification (E. Jones & Wessely, 2014). Psychiatric diagnostic classification of these disorders was believed to form a unified and consistent concept aiding communication between

clinicians and researchers allowing for cumulative refinement and promotion of understanding among professionals (Mezey & Robbins, 2001).

The first edition of the Diagnostic and Statistical Manuel (DSM-I; APA, 1952) included a diagnostic category dubbed '*Gross Stress Reaction'*, a label assigned to those experiencing pronounced distress following exposure to stressful stimuli. This was followed by '*Transient Situational Disturbance'* in the DSM-II (APA, 1968). These diagnoses however were both heavily criticised for lack of clear operational definitions of symptomology and for qualifyings as short-term reactions (E. Jones & Wessely, 2005). This undermined the validity of these disorders as chronic reactions to combat trauma were observed years after initial exposure (E. Jones & Wessely, 2014). In attempts to address these criticisms in each revision the APA revised criteria and definitions attempting to accurately quantify this reliably observed stressful reaction, heavily informed by veterans experiencing such reactions (Friedman, 2017; Jones & Wessely, 2005).

Researchers and clinicians while considering the prior concepts such as '*Shell Shock*', and '*Gross Stress Reaction*', in line with the original goals of classification, sought to describe and label a more unified and refined concept that described these post-traumatic issues (E. Jones & Wessely, 2014). In this pursuit the most substantial change in understanding occurred; acceptance of a solely environmental causative origin (E. Jones & Wessely, 2014). This lead to the advent of a new diagnostic concept which based on evidence available to the DSM-III Committee on Reactive Disorders provided the most effective codification of this mental health disorder; *Post Traumatic Stress Disorder* [PTSD] (Friedman, 2017).

1.4 Post-Traumatic Stress Disorder

PTSD was first formally recognised as a diagnostic classification in the Third Edition of the DSM (DSM-III) and was defined therein by a specific set of symptoms arising following exposure to a traumatic event or stressor in which the individual experience feelings of horror (APA, 1980). The specified symptoms in this edition were re-experiencing (dreams or hallucinations of the traumatic events), avoidance behaviours (avoiding stimuli that may be reminiscent of the trauma), and a heightened state of arousal (being 'jumpy', irritable, or intensely aware of surroundings) experienced for a period of at least one month (APA, 1980). This conceptualisation of PTSD placed the disorder firmly in the category of '*Fear or Anxiety Disorders*', a categorisation that remained until the most iteration of the DSM, the DSM-5 (APA, 2013), in which it was reclassified as a '*Trauma and Stressor Related Disorder*' (Zoellner, Rothbaum, & Feeny, 2011).

PTSD is argued to be inextricably and causatively linked the stressful exposure with the 'A criterion', i.e. exposure to a potentially traumatic event being central to the diagnosis and the first criteria that must be satisfied (North, Suris, Davis, & Smith, 2009). Historically there has also been a requirement that experience of the event resulted in feelings of fear or horror for the subject (Karam et al., 2010). Prior research has indicated that symptomatic groups reporting the A2 criterion differed significantly than those who do not with regard to the factorial structure of PTSD symptoms (C. Armour et al., 2011). This finding is speculated to be due to more severe PTSD symptomology, distress, and impairment experienced by the group reporting the A2 criteria (C. Armour et al., 2011). Evidence has shown however that such adverse peri-traumatic emotional responses are highly predictive of PTSD development but are not necessary (Brewin, Andrews, & Rose, 2000). In contemporary diagnostics the A2 criteria has therefore been recommended to be considered a risk factor for, rather than necessary component of, diagnosis (Karam et al., 2010). In summary the two defining characteristics of PTSD are considered to be; the *exposure to a traumatic event*, and specified *psychological symptoms* arising from exposure.

Since inception, the unique causal link between external trauma and symptoms purported by PTSD has remained despite numerous refinements and revisions (Mezey & Robbins, 2001). Similarly, as a wealth of research has contributed to furthering empirical understanding of PTSD the core symptoms first described in the DSM-III [Re-experiencing, Avoidance, and Hypervigilance] have remained in as part of PTSD conceptualisation some capacity (Walton et al., 2017). Over time research has employed more advanced methodologies and analyses to understand the disorder. This has resulted in two differing frameworks of PTSD published in the main recognised classification systems for mental health disorders; the *DSM* and the *ICD*.

1.4.1 Diagnostic and Statistical Manual

As previously discussed, the DSM-III provided the first codified, empirically validated concept of post-traumatic distress reaction. This relatively unified concept of post-traumatic stress allowed for progress toward validation of the previously observed symptoms of those suffering from post-traumatic pathologies (E. Jones & Wessely, 2006). Owing to this, iterations of the DSM since the introduction of PTSD have refined the concept of this disorder, seeking to codify it in the most effective way. It is argued that the formal inclusion of PTSD in the DSM-III sparked an empirical movement to identify the best concept of post-traumatic stress reaction and provided the consistency in terminology to do so (Weiss, 2012). This procedure has involved the introduction, removal, and reclassification of symptoms and criteria based on the best evidence available at the time of each diagnostic classification systems' release.

The majority of contemporary research regarding post-traumatic stress and psychotrauma stems from the most recent iterations of the DSM; the *DSM-5* (APA, 2013). This system has sought to granularly divide and codify experiences of post-traumatic stress into more reliably observed symptom clusters (see *Table 1.1; Criteria for DSM-5 PTSD*). This has led to the implementation of diagnostic sub-types; Dissociative PTSD, and Childhood PTSD (APA, 2013).

Table 1.1; Criteria for DSM-5 PTSD

A **Exposed to one or more event(s)** (that involved death or threatened death, actual or threatened serious injury, or threatened sexual violation) in one of these ways;
   i. You experienced the event
   ii. You witnessed the event as it occurred to someone else
   iii. You learned about an event where a close relative or friend experienced an actual or threatened violent or accidental death
   iv. You experienced repeated exposure to distressing details of an event, such as a police officer repeatedly hearing details about child sexual abuse

B At least *one* of the following **intrusive symptoms** associated with the traumatic event:
   i. Unexpected or expected reoccurring, involuntary, and intrusive upsetting memories of the traumatic event
   ii. Repeated upsetting dreams where the content of the dreams is related to the traumatic event
   iii. The experience of some type of dissociation (for example, flashbacks) where you feel as though the traumatic event is happening again
   iv. Strong and persistent distress upon exposure to cues that are either inside or outside of your body that are connected to your traumatic event
   v. Strong bodily reactions (for example, increased heart rate) upon exposure to a reminder of the traumatic event

C Frequent **avoidance of reminders** associated with the traumatic event, as demonstrated by *one* of the following:
   i. Avoidance of thoughts, feelings, or physical sensations that bring up memories of the traumatic event
   ii. Avoidance of people, places, conversations, activities, objects, or situations that bring up memories of the traumatic event

D At least *three* of the following **negative changes in thoughts and mood** that occurred or worsened following the experience of the traumatic event:
   i. The inability to remember an important aspect of the traumatic event
   ii. Persistent and elevated negative evaluations about yourself, others, or the world (for example, "I am unlovable," or "The world is an evil place")
   iii. Elevated self-blame or blame of others about the cause or consequence of a traumatic event
   iv. A negative emotional state (for example, shame, anger, or fear) that is pervasive
   v. Loss of interest in activities that you used to enjoy
   vi. Feeling detached from others
   vii. The inability to experience positive emotions (for example, happiness, love, joy)

E At least *three* of the following **changes in arousal** that started or worsened following the experience of a traumatic event:
   i. Irritability or aggressive behavior
   ii. Impulsive or self-destructive behavior
   iii. Feeling constantly "on guard" or like danger is lurking around every corner (or hypervigilance)
   iv. Heightened startle response
   v. Difficulty concentrating
   vi. Problems sleeping

F	Above symptom persist for at least **one month**
G	The symptoms bring about **considerable distress** and/or interfere greatly with a number of different areas of your life.
H	The symptoms are not due to a medical condition or some form of substance use.

Note: Taken from DSM-5 and Very Well Mind (APA, 2013; Tull, 2018)

This revision notably made a number of changes relative to the previous iteration of PTSD published in the DSM-IV-TR (APA, 2000). As mentioned previously, the release of the DSM-5 has seen PTSD categorised as a 'Trauma or stressor related disorder'. This shift in conceptualisation by the APA has been met with some controversy as this considers PTSD as a condition separate from anxious disorders and undermines fear as a central component (see Zoellner et al., 2011). Indeed, there exists an on-going academic debate regarding the efficacy of the conceptual classification of PTSD as an anxiety or trauma related disorder as diagnostic systems have diverged on this in the past (Hafstad, Thoresen, Wentzel-Larsen, Maercker, & Dyb, 2017).

The DSM-5 further altered the recognition of potential 'A-criterion' events from previous iterations, restricting inclusion of some experiences such as medical emergency trauma and clarifying the qualities of stressful exposure that count as potentially traumatic, i.e. direct, indirect, or vicariously through repeated description (Pai, Suris, & North, 2017). Further to this, the previous A2-criterion stipulating that 'intense fear or horror' should be experienced at the time of trauma (APA, 1994) was removed. Peri-traumatic emotions have previously been shown to significantly predict PTSD symptom development (Brewin, Andrews, & Rose, 2000). Despite this, the presence of this criteria was largely controversial and evidence has suggested its inclusion does not greatly impact diagnosis rates (Karam et al., 2010).

Additionally, with the DSM-5 revision came an alteration from 17 constituent symptoms to 20, and reorganisation of previously established avoidance and 'emotional numbing' criteria. This came in response to evidence from factor analytic studies and of best performance in field trials of proposed criteria changes (Pai et al., 2017). The decision to endorse a more broad concept of PTSD symptomology in the DSM-5 is argued to provide more clinical utility and to capture more nuanced

presentations of the disorder as endorsements remain captured by the additional symptom criteria (Friedman, 2013). Systematic review of factor models of DSM PTSD has found the standard DSM-5 four-factor model to perform adequately, however more elaborate six and seven factorial models appear to outperform this (C. C. Armour, Műllerová, & Elhai, 2016). Indeed, in validation of the DSM-5 PTSD measurement and factor structure among veterans the most elaborate, seven-factor Hybrid model of PTSD was shown to perform optimally (Bovin et al., 2016). Conversely, researchers have endorsed a more parsimonious concept of PTSD endorsing only the core criteria citing good specificity [79%] in diagnostic identification for this model (Walton et al., 2017). It is this parsimonious structure of PTSD that informs the proposed structure for PTSD in the primary alternative manual for diagnostic classification (Brewin et al., 2017).

1.4.2 International Classification of Diseases

The main competing diagnostic classification system to the DSM is the *International Classification of Diseases* (ICD) published by the *World Health Organisation* (WHO). This manual provides an alternative concept of PTSD to the DSM with subtle variations in definition and in the algorithms used to satisfy a diagnosis of PTSD. However it is noted that in the most recent publications; the ICD-11 and DSM-5, criteria diverge more greatly than previous versions (Brewin et al., 2017). The ICD-11 diagnostic framework proposes a more parsimonious model proposing criteria be met on three symptom clusters; *Re-experiencing*, *Avoidance*, and a heightened *Sense of Threat* (WHO, 2019a).

The revised criteria implemented in the ICD-11 (see *Table 1.3; Criteria for ICD-11 PTSD*) specifically differ from DSM-5 revisions requiring presentations to be characterised by one symptom from each of the three core clusters in addition to functional impairment. This diagnostic requirement was felt to be suitably inclusive while also providing an appropriate threshold for caseness; probable diagnosis based on screening of symptoms (Brewin, 2013). This algorithm was implemented to increase the specificity of diagnosis and reduce the incidence of comorbid diagnosis

(Brewin, 2013), and is used in standardised measurement of ICD-11 PTSD (Cloitre et al., 2018).

Table 1.2; Criteria for ICD-11 PTSD

A	Develops following exposure to an extremely threatening or horrific event or series of events
1)	**Re-experiencing** the traumatic event or events in the present in the form of vivid intrusive memories, flashbacks, or nightmares, which are typically accompanied by strong and overwhelming emotions such as fear or horror and strong physical sensations, or feelings of being overwhelmed or immersed in the same intense emotions that were experienced during the traumatic event
2)	**Avoidance** of thoughts and memories of the event or events, or avoidance of activities, situations, or people reminiscent of the event or events
3)	Persistent **perceptions of heightened current threat**, for example as indicated by hypervigilance or an enhanced startle reaction to stimuli such as unexpected noises
	Symptoms must be present for several weeks and confer significant impairment in personal, family, social, educational, occupational or other important areas of functioning

Note: Taken from ICD-11; 6B40 (WHOc, 2019a)

This revision to an even more parsimonious definition of PTSD symptoms is also hoped to reduce the rates of over diagnosis or misclassification (Brewin, 2013). This has led to much interest from researchers as to what effect this reclassification may have of PTSD prevalence estimates, co-morbidity statistics, and classification concordance between the new definition and its predecessor (Kuester et al., 2017).

Research conducted with a nationally representative sample of the US general population, and two help-seeking samples presenting at the US Veterans Affairs services showed that the ICD-11 criteria yielded prevalence estimates between 25%-50% lower than its predecessor; the ICD-10 (Wisco et al., 2016). Barbano et al. (2018) further compliment these findings with a study of clinical observations of a trauma-exposed sample finding a lower prevalence estimate using ICD-11 criteria and that those meeting these criteria were likely to suffer greater symptom severity, as measured by the Clinician Administered PTSD Scale, than the group meeting ICD-10 caseness. Together these results suggest that the proposed ICD-11 PTSD criteria increase the specificity of diagnosis in line with stated goals (Brewin, 2013; Maercker, Brewin, Bryant, Cloitre, Reed, et al., 2013).

Kuester et al. (2017) address the diagnostic agreement of systems with an examination of the various diagnostic systems among active members of the German Armed Forces. These results showed that agreement between the ICD-10 and ICD-11 criteria was relatively low [62%]. It was found that several respondents not meeting caseness under ICD-10 criteria were eligible to meet caseness due to the removal of the onset time criterion, i.e. symptoms must develop within six months of traumatic exposure. It is argued that this criteria change in criteria allows for the capture of late on-set cases which have been found to be significantly more common in military samples compared to traumatised civilian populations (B. Andrews, Brewin, Philpott, & Stewart, 2007; Kuester et al., 2017).

Results from the aforementioned study with a US general population and VA sample however found that the change in diagnostic criteria had no significant effect on comorbidity rates within the samples (Wisco et al., 2016). Additionally, it was found that among the trauma-exposure treatment-seeking sample ICD-11 was associated with comparable or increased incidence rates of comorbidity with mood and anxious disorders at multiple time points (Barbano et al., 2019). These findings demonstrate that the ICD-11 criteria revision has served to revise the specificity of identification but has not served to reduce comorbidity prevalence. Cloitre, Garvert, Brewin, Bryant, and Maercker (2013) however argue for that acceptability of comorbidity in that common or shared symptoms should not detract from the utility of specifying a distinct syndrome which has different core symptoms, expressions, and clinical considerations. Equally, it might be noted that more general psychological co-morbidity may be central to post-traumatic stress and hence it's presence does not detract from the accurate classification of PTSD.

1.4.3 Comparison of PTSD in the DSM-5 and ICD-11 Diagnostic Systems

These two competing diagnostic systems contest the position of 'gold standard' measurement, however both have been met with criticisms concerning specificity

and comorbidity of symptoms, ill-defined trauma criteria, and restrictive concepts of trauma reactions (Kuester et al., 2017). This has led to a concerted effort to critically examine diagnostic classifications; in relation to their predecessors to ensure progress in understanding, and in relation to one and other to find the most efficacious method of assessment.

One of the most salient differences between the systems is that as the DSM has added further symptoms and fractured clusters in order to gain specificity, while the ICD has sought to restrict symptom clusters to only three (see *Table 1.3; Criteria for ICD-11 PTSD*). It should however be noted that despite the division of symptom clusters both diagnostic systems broadly recognise similar core symptoms leading reliability to the PTSD construct. Indeed, in the DSM-5 revision to PTSD NACM criteria additional symptoms relating to affect dysregulation and negative self-concept were included highlighting conceptual similarities between systems (Cloitre et al., 2013). Brewin (2013) however notes that there has been considerable controversy over the specific characterisation of symptoms and the importance of each cluster or category.

Stein et al. (2014) provide an examination of diagnostic rates of PTSD as defined by both APA [DSM-IV & DSM-5] and WHO [ICD-10 & ICD-11] criteria. In this study respondents endorsing symptomology to meet criteria for diagnosis in at least one diagnostic system were categorised as *broadly defined PTSD*. In this groups however, one third met criteria in all four systems (Stein et al., 2014). The four classification systems hence specified different prevalence rates of PTSD; ICD-10 [4.4%], DSM-IV [3.3%], ICD-11 [3.2%] and DSM-5 [3.0%]. This highlights the difference in sensitivity and specificity of these diagnostic algorithms and implications for assessment. For instance, an individual presenting may receive a differential diagnosis based on the criteria applied possibly denying access to treatment that would otherwise benefit them and reduce distress (Barbano et al., 2019).

Further to this, Hafstad et al. (2017) showed that among young people exposed to terrorist violence and their parents that the ICD-11 classification system yielded a significantly lower prevalence estimates of PTSD than the DSM algorithms at two time points. Moreover, the authors note the lack of overlap of identification using

the two systems with over half [51.7%] those meeting caseness criteria for the DSM-5 failing to do so using ICD-11 criteria. Despite the lack of concurrence between systems it was concluded that both effectively identified those experiencing clinically significant distress and impairment, but this provides an important consideration for research in this area.

Evidence from Hyland et al. (2016) showed that in a treatment seeking sample of Danish incest survivors the DSM-5 diagnostic criteria screened 60.0% positively for PTSD while the ICD-11 criteria indicated only 49.1% as having probable PTSD. It was found that within the ICD-11 algorithm endorsement for re-experiencing symptoms was rather low and this contributed to the discrepancy in prevalence rates. This study, as with many of the nascent ICD-11 PTSD concept, made use of a proxy measure, the Harvard Trauma Questionnaire, and the then proposed criteria for ICD-11 PTSD during development.

Additionally, Knefel and Lueger-Schuster (2013) found that the proposed ICD-11 criteria yielded significantly lower prevalence estimates of PTSD compared to its predecessor. This consistent reduction is thought to mark a move toward the diagnostic systems converging on estimates as DSM and ICD criteria move toward specifying the same disorder and individuals (Knefel & Lueger-Schuster, 2013). Current evidence does however suggest these algorithms may not concur and specify the same individuals as meeting caseness for PTSD (Wisco et al., 2017). Indeed, Hafstad et al. (2017) found the two diagnostic systems successfully identified those experience the greatest distress, 8.0% of respondents were captured by both criteria while 5.6% met criteria for only one system. This suggests that although newer systems produce more similar prevalence estimates, these may not encompass individuals reporting the same distress.

A key goal of the ICD-11 classification system of PTSD at the proposal and development stage was to effectively discern PTSD symptomology and to reduce the incidence of spuriously diagnosed co-morbidity with anxiety reactions, and the potential overuse of PTSD diagnosis (Maercker, Brewin, Bryant, Cloitre, Reed, et al., 2013). For this reason, the ICD-11 diagnostic criteria were narrowly defined with strict adherence to central concepts of PTSD alone (Hansen, Hyland, Armour, Shevlin, &

Elklit, 2015; D. J. Stein et al., 2014). Galatzer-Levy and Bryant (2013) provided a valuable critique of the use of diagnostic systems notable citing the wide heterogeneity of possible symptoms that may result in a diagnosis of PTSD with '636,120' possible combinations of symptoms in the DSM-5. In contrast to this, the ICD-11 criteria are noted to produced 27 possible symptom combinations resulting in diagnosis (Shevlin et al., 2018). This may partially explain the wide variety of prevalence rates observed using different diagnostic systems (see Stein et al., 2014) as the specificity of such algorithms can result in different effective 'sorting' of presentations.

Brewin (2013) offers conclusion in that the existence of these two diagnostic systems, although certain to cause confusion and debate, only serves to benefit empirical understanding as evidence reconciles their differences.

1.4.4 Differential Post-Traumatic Diagnoses

In efforts to reconcile differences in diagnostic criteria and clinical observations research has sought to not only reclassify and refine PTSD, but to codify other distinct post-traumatic stress reactions. This has taken the form of new diagnostic subtypes as previously mentioned; *Dissociative* and *Childhood PTSD* (APA, 2013), and a novel diagnosis of *Complex PTSD* [C-PTSD] (WHO, 2019b).

The implementation of a new disorder, or indeed a sub-classification of a disorder, within psychology and psychiatry demands a large amount of supporting evidence of the aetiology of the proposed syndrome, as well as reliable and valid measurement of the phenomena (Resick et al., 2012). Additionally, it is important that the proposed new diagnostic concept is sufficiently differentiated from any cognate issue currently recognised and is reliably observed (Resick et al., 2012). For instance, the emerging diagnosis of C-PTSD may bare similarity to the symptoms to existing conditions (e.g. Disorders of Extreme Stress Not Otherwise Specified [DESNOS], or Borderline

Personality Disorder [BPD]) however proposed diagnostic criteria should be unique and stable as an independent diagnosis (Brewin et al., 2017).

Research has sought to understand the mechanisms by which PTSD, its sub-types and differential diagnoses may be distinguished (Armour, Elklit, Lauterbach, & Elhai, 2014; Armour, Karstoft, & Richardson, 2014; Cloitre, Garvert, Weiss, Carlson, & Bryant, 2014). This concerted effort has led to the application of sophisticated statistical techniques to qualify and to distinguish diagnostic constructs from one and other. There is a heavy burden such evidence must carry to justify inclusion requiring consistent findings using this nuance techniques for diagnostic inclusion. Indeed, Weiss (2012) notes that if contemporary standards for diagnostic inclusion were applied in 1970 the diagnosis of PTSD would not have met the requirements.

Diagnostic Subtypes and 'Sibling Disorders'

In addition of diagnostic entities the DSM has elected to differentiate 'sub-types' of PTSD, diagnostic discrepancies which are argued to be subordinate part of PTSD. These subtypes are stipulated by the DSM-5 to be *Dissociative* and *Childhood* PTSD (APA, 2013). These subtypes are conceptualised as meaningfully distinct but subordinate pathologies related-to PTSD, with differing aetiology or mechanisms (Dalenberg, Glaser, & Alhassoon, 2012). The ICD-11 contrasts this approach instead recognising the emergent construct of C-PTSD not as a sub-type but as a related diagnosis to that of PTSD. It should be noted that evidence and diagnostic guidelines hold that PTSD and C-PTSD are related but entirely exclusive diagnoses (Cloitre et al., 2018; Karatzias, Shevlin, et al., 2017). The primary difference between these approaches is that sub-types are conceptualised as part of a higher-order disorder while sibling diagnoses are considered related but distinct entities (Brewin et al., 2017). Both these approaches have the common goal of better describing and classifying meaningfully different pathologies (Brewin et al., 2017; Dalenberg et al., 2012).

It was determined by the PTSD working-group responsible for revisions to the disorder prior to the release of the DSM-5 felt that there was insufficient evidence to warrant the inclusion of a 'complex PTSD subtype' (Resick et al., 2012). Hence the ICD-11 currently provides the sole formal recognition of the disorder. Interestingly, research has shown dissociative symptoms to be positively associated with C-PTSD symptomology prompting consideration of how these diagnostic categories or subtypes may interact (Dorahy et al., 2017, 2013).

These subtype or alternative diagnostic categories often represent a sub-group of individuals for whom these symptom profiles or clusters more accurately represent their experience or pattern of symptoms. For instance, Armour, Elklit, et al. (2014) applying Latent Profile Analysis found that among treatment-seeking survivors of sexual assault and rape there was a unique class of individuals (13.1%) for whom the dissociative PTSD sub-type best represented their symptoms endorsement. By extension, Cloitre, Garvert, Brewin, Bryant, and Maercker (2013) applied the same statistical technique to a treatment-seeking, trauma-exposed sample in the US. These results showed that a distinct class of individuals (36.1%) could be described by C-PTSD symptomology and distinguished from those experiencing PTSD or Borderline Personality Disorder.

PTSD is argued to be highly co-morbid with other psychological symptoms and disorders (Foa, Cashman, Jaycox, & Perry, 1997; Ginzburg, Ein-Dor, & Solomon, 2010) and is associated with cognate symptoms of affect dysregulation, dissociation, and lifestyle/behaviour problems (Miao, Chen, Wei, Tao, & Lu, 2018). There are additional considerations in clinical appreciation of PTSD, for instance it has been demonstrated that feelings of shame and guilt may contribute to PTSD symptomology (D. A. Lee, Scragg, & Turner, 2001). Additionally, symptoms of emotional dysregulation and difficulties creating and maintaining relationships are consistently associated with PTSD on theoretical and empirical bases (Cloitre et al., 2013; J. L. Herman, 1992). Such observations have prompted greater empirical research into the cognate symptoms and experiences associated with PTSD which may in fact truly represent distinct syndromes, e.g. Complex PTSD (Cloitre et al., 2009).

Despite efforts to capture the wide range of potential post-trauma sequelae using existing diagnostic categories and algorithms it may be argued that current codifications do not capture the full range post-trauma psychological distress (Nixon & Bralo, 2019). Understanding of PTSD and related disorders is hence more nuanced than strict adherence to diagnostic algorithms. Continuous examination and testing of such criteria is essential to building empirical understanding of post-traumatic distress (Pai et al., 2017). Many of the cognate post-trauma syndromes remain under investigated. For example, the concept of C-PTSD has been recently codified and is currently being validated across populations and contexts (Cloitre et al., 2018; Hyland, Shevlin, Brewin, et al., 2017; Knefel, Karatzias, et al., 2019). Despite this few studies examine this diagnostic concept among military veterans, a population for which the study of traumatic stress reaction is particularly apt (Mordeno, Nalipay, & Mordeno, 2019).

Conclusion

The growing body of literature concerning traumatic stress has highlighted a need to understand the myriad of symptoms that beget additional syndromes of post-traumatic stress beyond those recognised by core PTSD. Of particular interest in this thesis is the area of *C-PTSD* as this has been included as a new sibling-disorder to PTSD in the ICD-11 (Hyland, Shevlin, Fyvie, & Karatzias, 2018). Further to this, much of the foundational literature primarily concerns survivors of childhood Complex Trauma, neglecting cumulative or repeated trauma in adulthood as a risk for C-PTSD (Palic et al., 2016; Wolf et al., 2015). The following sub-section [*Chapter 1.5; Complex PTSD*] elaborates on this concept, introducing the concepts of Complex Trauma and ICD-11 C-PTSD symptomology.

1.5 Complex PTSD

The ICD-11 proposes an additional sibling diagnosis of C-PTSD that encapsulates post-traumatic stress reactions as characterised by traditional PTSD with additional consideration for symptoms of '*Disturbances in Self-Organisation*' [DSO] (Cloitre et al., 2009). These DSO symptoms (see *Table 1.3; Criteria for ICD-11 C-PTSD*) are described as *Affect Dysregulation*, *Negative Self-Concept*, and *Disturbed Relationships* (Cloitre et al., 2013). This diagnosis is further differentiated from that of PTSD as the preceding traumatic exposure is argued to often be qualitatively different, dubbed '*Complex Trauma*'. This type of experience is said to be characterised by pervasive and repeated exposure to traumatic stimuli from which escape is difficult or impossible (Courtois, 2004; J. L. Herman, 1992).

This definition of complex traumatic exposure is codified in the ICD-11 diagnostic framework and considered a risk factor for C-PTSD (Cloitre et al., 2018; WHO, 2019b). Given this definition, this condition has historically been considered to be associated with survivors of childhood trauma and abuse (J. L. Herman, 1992; Knefel, Lueger-Schuster, Karatzias, Shevlin, & Hyland, 2019). It should however be noted that contemporary understanding is extended to encapsulate other experiences of cumulative trauma such as repeated warzone deployment (Courtois, 2012). This sub-section discusses those main features of C-PTSD outlined in *Table 1.3* below; the antecedent *Complex Trauma* and characteristic *DSO symptoms*.

Table 1.3; Criteria for ICD-11 C-PTSD

	May develop following exposure to an event or series of events of an extremely threatening or horrific nature, most commonly prolonged or repetitive events from which escape is difficult or impossible (e.g., torture, slavery, genocide campaigns, prolonged domestic violence, repeated childhood sexual or physical abuse)
	All core symptom criteria must be satisfied for diagnosis of PTSD (see *Table 1.2*)
1)	Severe and pervasive problems in **affect regulation**
2)	Persistent **beliefs about oneself as diminished**, defeated or worthless, accompanied by deep and pervasive feelings of shame, guilt or failure related to the traumatic event
3)	Persistent **difficulties in sustaining relationships** and in feeling close to others
	The disturbance causes significant impairment in personal, family, social, educational, occupational or other important areas of functioning.

Note: Taken from ICD-11; 6B41 (WHO, 2019b)

1.5.1 Complex Trauma

As stated *Complex Trauma* is defined as stressful or potentially traumatic exposure that is prolonged or chronic in nature and is typically difficult to escape (J. L. Herman, 1992). Previously it has been believed exposure in childhood or at critical developmental stages to be integral to the concept (Courtois, 2004). Contemporary understanding, while recognising the unique risk such traumatic exposure poses, has extended to include stressful exposure in adulthood. Specifically it is thought that similarly prolonged or severe traumas, particularly those interpersonal in nature, may also be considered Complex Trauma (Courtois, 2004, 2008).

As alluded, historical perspectives of Complex Trauma theorised that traumatisation, particularly assaultive or interpersonal trauma, in childhood may cause developmental disturbance which in turn negatively influence the development and outcomes of survivors (J. L. Herman, 1992; Pearlman & Courtois, 2005). There is a body of literature describing a similar concept; *Developmental Trauma Disorder* [DTD], characterised by emotional difficulties, altered cognitions, and functional impairment in relevant aspects of childhood interactions (van der Kolk, 2005). DTD similarly asserts that the current diagnostic criteria of PTSD to not full capture the range of post-trauma symptoms leading to its proposed inclusion the DSM-5 (van der Kolk et al., 2009).

This proposal was however unsuccessful, and DTD was not included in the DSM-5 at release. This did not deter researchers and clinicians as focus was largely shifted to codifying Complex Trauma and C-PTSD to include aspects of developmental trauma and disturbance described by DTD (Sar, 2011). Such trends in the literature around the inception of Complex Trauma theory led to a large focus on childhood trauma and developmental disturbance as constituent parts of this concept. The extant research and perspectives of Complex Trauma are therefore considered in relation to traumatic exposure in *childhood* and in *adulthood*.

Complex Trauma in Childhood

One of the seminal developmental theories in psychology is that of '*Critical*' and '*Sensitive periods*'. This theory posits that there are specific periods of development at which children are particularly adaptive in response to their environment; i.e. sensitive periods at which development trajectories may be fundamentally altered (Singleton, 2005). Much research considers the impact of childhood trauma on developmental outcomes, e.g. mental ill-health, as a function of brain development (Heim & Binder, 2012). It is argued that aversive psychological states and maladaptive cognitions and behaviours become integrated into the developing brain, leading to lasting psychopathological symptoms (Perry, Pollard, Blakley, Baker, & Vigilante, 1995).

Further to this, it is hypothesised that specific brain regions develop at different times and that stressful exposure during these times may have differential outcomes for development (Andersen et al., 2008). Andersen et al. (2008) exemplify this with a neuro-imaging study of self-identified childhood sexual abuse survivors. Findings from this study showed that among survivors of repeated childhood sexual abuse those exposed early in childhood (0-5 years old) exhibited greatest neurobiological deficits. It was further found that exposure at particular period was associated with specific psychopathological outcomes. For instance, exposure 3-5 years old was associated with elevated risk for Depression, while exposure 9-10 years old was associated with risk for PTSD caseness (Andersen et al., 2008). These results support that the nature and timing of stressful exposure may confer additional risk of negative mental health outcomes. For instance, in the case of Complex Traumatic exposure stressors are likely to be interpersonal, prolonged, and possible to be severe in nature. All of these trauma features are associated with greater neuro-biological change during development (Andersen et al., 2008). Therefore, Complex Trauma exposure may be considered a salient risk factor for developmental disturbance through a biological 'critical *period*' hypothesis.

By extension of this, Dunn, Nishimi, Powers, and Bradley (2017) provide epidemiological evidence from data collected as part of the Grady Trauma Project in the USA. These results showed that exposure to trauma in early childhood (0-5 years

old) and middle childhood (6-10 years old) were associated with greater likelihood of experiencing PTSD and depression above that of traumatic exposure in adolescence. These results support the assertion that traumatic exposure in childhood is associated with particular psychopathological risk, argued potentially by function of early brain development. However, findings that middle childhood trauma is also indicative of risk of mental ill-health suggests there may be additional consideration of potential underlying *psycho-social mechanisms* of early Complex Trauma. In contrast, research has identified a dose-response relationship between childhood trauma and C-PTSD with successive traumas having an additive risk for symptomology (Hyland, Murphy, et al., 2017). This suggests that C-PTSD as an outcome may be significantly predicted by the sum of traumatic stress rather than violation of any specific sensitive period.

Similarly, Complex Trauma in childhood is argued to result in maladaptive *cognitive* development and *coping strategies*. Chronic or repeated traumatic exposure is argued to lead to failure in development of affect regulation strategies and adoption of maladaptive cognitions and behaviours among children (Cook et al., 2005). These characteristics are considered integral features of C-PTSD symptomology and hence it is argued that these manifest as a result of failure to successfully process stressful experiences. It is argued that interpersonal trauma in childhood, particularly that perpetrated by a caregiver or attachment figure, is particularly harmful to the development of self-identity and relational skills (Cook et al., 2005). This experience of Complex Trauma is likely to lead to the formation of *unsecure attachments* which are associated with later mental health difficulties and psychosocial disturbance (Cook et al., 2005; Pearlman & Courtois, 2005). Traumatic exposure at such time(s) is thought to also contribute to *disorganised attachments* and difficulties with interpersonal relationships (Bonanno, Galea, Bucciarelli, & Vlahov, 2007). Hence experience of complex trauma may be argued to result in removal of potentially protective factors, yielding a qualitative different and potential more severe set of post-traumatic symptoms.

Finally, Williams (2006) draws on narratives from survivors of childhood abuse to evidence the potential for Complex Trauma in childhood to fundamentally change

the view of one's self and the world at large. The perpetration of abuse by a caregiver, as is a theorised case of Complex Trauma, is argued to disturb developmental trajectories, disrupt attachments, and finally to disturb and disrupt aspects of identity. It is argued that this, coupled with the loss of support associated with this situation, results in significant distress that it is difficult to be resilient to (Williams, 2006).

Given this evidence it is argued that Complex Trauma in childhood is associated with difficulties in Attachment, Regulation, and Self Competencies all of which contribute to the experience of psychological distress and pose a unique risk for a C-PTSD (Kinniburgh, Blaustein, Spinazzola, & van der Kolk, 2005). These disturbances and maladaptive symptoms may however not be isolated to those exposed to childhood trauma. The following section draws on evidence of cumulative trauma in adulthood to constitute Complex Trauma.

Complex Trauma in Adulthood

As previously mentioned contemporary understanding has extended this definition to include cumulative interpersonal trauma in adulthood also (Cloitre et al., 2009; Pearlman & Courtois, 2005). Briere and Scott (2015) argued that repeated or cumulative traumatic exposure results in more negative outcomes beyond that of traditionally understood PTSD with a single index trauma event. It is hypothesised that such cumulative exposure results in fundamental psychological, social, and neurobiological changes by which complex trauma begets 'complex outcomes' (Briere & Scott, 2015). It is suggested that re-experiencing symptoms and the revisiting of traumatic memories serve to maintain symptomology and distress among those experiencing PTSD (Ehlers, 2010). It is hence arguable that the lived experience of prolonged trauma adds to the '*allostatic load*' of experiences maintaining and engraining psychological symptoms (Williams, 2006).

In an examination of C-PTSD and traumatic predictors Palic et al. (2016) compared several populations exposed to childhood trauma, adulthood severe interpersonal

intensity trauma (e.g. Prisoner of War [POW] Torture survivors), and adulthood trauma survivors of low interpersonal intensity (e.g. military veterans not formerly captured, and paramedics). Results showed that CSA survivors, Refuges, and Ex-POWs were more likely to endorse C-PTSD symptoms than those low intensity trauma-exposed populations. It was also noted survivors of low severity interpersonal trauma, i.e. military veterans not exposed to torture and mental health care providers, had the lowest endorsements of C-PTSD symptomology. C-PTSD symptoms remained an issue however with endorsements ranging from 5% to 25% within the military veteran sample suggesting that this may be a relevant issue for a subset of this group. Importantly however the results of this study supported that C-PTSD symptomology is not exclusively observed following childhood trauma and may be said to be related instead to severe and prolonged trauma at any point in the life course (Palic et al., 2016).

It is proposed that Complex Traumatic Experiences may constitute a '*risk factor caravan*'. This process proposed by Layne et al. (2009) builds on the Conservation of Resources theory speculates that cumulative and successive adversities form adaptive and maladaptive strategies of stressor management. More specifically; it is theorised that the sum of adversity cumulatively exacerbates pathology and the risk thereof, and this risk is carried with the individual across time (Layne, Briggs, & Courtois, 2014). From this perspective it is hypothesised that the cumulative nature of Complex Trauma or poly-traumatisation across the life course may contribute significantly to more adverse mental health outcomes. This appears to be supported by empirical investigation finding accumulative trauma across adulthood to have an additive effect to risk for C-PTSD following childhood trauma and adversity (Cloitre et al., 2009; Frewen, Zhu, & Lanius, 2019).

Therefore there is a rationale for the examination of the explanatory power of additional theories of Complex Trauma not restricted solely to childhood traumatic exposure. There are several potential mechanisms of C-PTSD applicable across the life course considered through a *biopsychosocial* perspective;

Biological Theories

Toxic Stress is a biological theory of early childhood development disruption that causes changes to the sympathetic nervous system that leads to changes to cognitions and behaviours (Franke, 2014). Evidence from animal model studies has demonstrated that anxiety reactivity is a salient factor in neuronal response to stress (Muigg et al., 2009). Further to this, Banasr et al. (2017) used functional Magnetic Resonance Imaging (fMRI) techniques and found that mice exposed to mild, but chronic stress, exhibited an altered brain networking that prioritised the function of the amygdala. Results reported in the same study from fMRI obtained from human participants exposed to 'low' or 'high' childhood adversity showed a similar alteration in brain networking (Banasr et al., 2017). It is hence argued that occurrence of traumatic exposure in childhood may lead to a vulnerability to traumatic stress later in adulthood.

In a review of 25 years of human genetics research compromising twin studies and genome sequencing, Duncan, Cooper, and Shen (2018) concluded that there is ample evidence for a polygenetic risk or vulnerability for the development of PTSD following trauma. Application of a *Diathesis-Stress Model*, where pre-existing risk is 'activated' by experience of stressful stimuli (McKeever & Huff, 2003), would hold that complex or cumulative trauma acts as a significant stressor that activates and exacerbates post-traumatic stress. This may be argued to result in a differentiated expression of post-traumatic stress; C-PTSD.

In addition to this, further research with animal models has shown that exposure to prolonged stressful stimuli at various stages in life may lead to neuron damage and alterations to brain structures by way of hormone secretion (Lupien, McEwen, Gunnar, & Heim, 2009). Taken together these results suggest that the Complex Trauma theoretical mechanisms may be underpinned by biological functions of *neuronal activation* and *stress hormone secretions* both in childhood and later in life. These biophysiological conclusions are however drawn almost exclusively from evidence obtained in the study of rodent subjects, limiting the generalisability and utility of results. Evidence for C-PTSD as a psychological condition is therefore best drawn from diverse trauma-exposed human subjects (Palic et al., 2016). To this end,

a purely biomedical model is not satisfactory to understand this disorder. Rather the interaction of biomedical factors, such as toxic stress, with other socioenvironmental factors that is argued to serve as the casual factor of mental ill-health (Shonkoff et al., 2012). Additional mechanistic theories are therefore explored.

Psychological Theories

Psychological theories that may contribute to the theorised mechanisms of Complex Trauma reaction typically involve behavioural and cognitive explanations. One behavioural theory applied to the understanding of post-traumatic symptoms is that of *Operant Learning* or *Classical Conditioning*. These behaviour paradigms theorise that PTSD symptoms may be acquired through the association of behaviours and traumatic memories or reminders, i.e. avoidance of reminders of the antecedent traumatic event are negatively reinforced by the absence of distress (Foa & Meadows, 1997). In the case of Complex Trauma, it may be that avoidance is not possible or perceived to be so. This experience may hence be argued to go beyond standard behaviourist learning paradigms, extending to *Learned Helplessness*.

Learned Helplessness as a theory originates from experimental evidence of animal subjects where inability to escape or avoid aversive stimuli results in a state of apathy or 'learned helplessness' where the subject passively allows the experience (Abramson, Seligman, & Teasdale, 1978). As humans aim to engage more cognitively with their environment it is argued that they may more actively seek coping strategies to avoid negative affect when compared to animal subjects. Abramson et al. (1978) however argues that where adversity is attributed internally, i.e. the adversity is experienced regardless of the expected correct behaviour, this may lead to psychological distress. It is hence argued that when exposed to Complex Trauma it is possible that individuals may become distressed by inability to avoid the stressor/adverse stimuli and internalise a state of Learned Helplessness.

Alternative proposals may include cognitive explanations. For instance, internalisation of abuse and aspects of Complex and chronic Trauma is argued to be deeply problematic and lead to pervasive problems such as the DSO symptoms described by C-PTSD. One such theorised method of internalisation is *Cognitive Schemas*, the development of an internal 'script' or a learned organisation of information which form the basis of world beliefs and behaviours (Padesky, 1994). It is believed that the majority of 'core schemas', those which are central to the formation of personality and beliefs, are formed in childhood and that traumatic exposure at this time significantly affects this process (J. P. Price, 2007).

The link between PTSD and facets of memory is commonly cited and explored in empirical literature as many central aspects of the disorder involve memory processing and re-experiencing (Brewin & Holmes, 2003). Complex Trauma results in a chronically maladaptive schema being formed and maintained, leading to the re-expression or increased severity of psychopathology in response to subsequent stressors (Padesky, 1994). It is arguable that the experience of chronic or repeated trauma results in this scheme becoming more deeply entrenched in cognitions and behaviours leading to exacerbation of PTSD symptomology and the additional DSO symptoms characteristic of C-PTSD.

It is argued that purely biological or psychological theories adopt an approach too isolationist or individual centred to fully account for factor contributing to post-traumatic outcomes following complex trauma.

Social Theories

It is therefore considered that aspects of one's environment contribute the symptom development and maintenance. The first such theory to blend psychological and social outlooks is *Social Cognitive Theory*. This approach extends cognitive schema theory as previously described is applied in future social-environmental interactions (Huesmann, 1998).

Stevens and Jovanovic (2018) posit that *Social Cognition*, the interaction between individual's thoughts and their evaluation of the environment and others in it, influences the development of PTSD as a maladaptive reaction to traumatic stimuli. Nietlisbach and Maercker (2009) concur with this, adding that the experience of trauma fundamentally changing interpersonal skills and strategies is itself a post-traumatic symptom in addition to core PTSD symptomology. Stevens and Jovanovic (2018) applied a meta-analytic method to examine the role of social cognition and found that poor or negative social cognition serves as a risk factor for the development of PTSD and of threat perception as measured by neuroimaging methods. This evidence in addition to previously discussed psychological theories is argued to substantiate the hypothesis that Complex Trauma exposure confers a unique risk of chronic and complex post-traumatic reactions.

Once again blending psychological and social perspectives is *Adult Attachment Theory,* typical ways in which one relates to others socially (Hudson & Fraley, 2017). This, similar to the theory of childhood attachment disruption, more specifically posits that disturbances to adult attachments as a result of interpersonal trauma exposure leads to adverse mental health outcomes. Research agrees with this, indicating that anxious or unsecure attachments in social and romantic relationships mediate the relationship between traumatic exposure and negative mental health outcomes (Steven Rholes, Paetzold, & Kohn, 2016) It is argued that disruption to adult attachment styles results in the removal of positive social relationships, a factor highly associated with PTSD symptom development (Bonanno et al., 2007; Woodhouse, Ayers, & Field, 2015). Extension of this understanding holds that Complex and interpersonal trauma may result in disorganised or unsecure attachment in peer-to-peer relationships in adulthood, which in turn contributes to great psychopathological problems.

It is argued that there are numerous potential mechanisms by which Complex Trauma may influence psychological outcomes of those subject to exposure. These potential mechanisms stem from existing biological, psychological, and social theories however it is argued that the best approach to understanding this phenomenon considers the

intersectionality of these three domains; adopting a Biopsychosocial approach to understanding.

1.5.2 Disturbances in Self Organisation

The second integral facet of C-PTSD is the expression of a novel set of symptomologies beyond that described by traditional PTSD diagnoses. An individual is said to meet criteria for diagnosis of C-PTSD if they endorse at least one of symptom in each dimensions of PTSD; Re-experiencing, avoidance, and hypervigilance, in addition to endorsement of three so-called DSO symptoms as highlighted in *Table 1.3*; *Affect Dysregulation, Negative Self-Concept*, and *Interpersonal Difficulties* (Cloitre et al., 2018; Kazlauskas, Gegieckaite, Hyland, Zelviene, & Cloitre, 2018). These symptoms are common facets of other mental health conditions and as such historical presentations of what would be recognised as C-PTSD were categorised as co-morbidity with PTSD (Brewin et al., 2017). Evidence from Latent Profile Analyses (LPA) however support the inclusion of these DSO symptoms with recognised core PTSD symptomology as part of a unified C-PTSD construct (Cloitre et al., 2013; Hyland, Shevlin, Brewin, et al., 2017).

Negative Self-Concept

The first DSO symptom considered is *Negative Self-Concept*, pervasive beliefs about the self as diminished or internally attributed feelings of shame and guilt (Cloitre et al., 2013). This construct is characterised by C-PTSD diagnostic criteria specifically by feelings of worthlessness and being a failure (Cloitre et al., 2018).

Dorahy et al. (2013) posit that trait shame and guilt play a role in the manifestation of maladaptive behaviours and cognitions in relation to PTSD. In a study with treatment seeking survivors of Troubles-related violence it was found that individuals presented maladaptive behaviours that impacted interpersonal relationships. It was

further noted that an 'attack self' script was commonly observed in the clinical setting among these service users where negative cognitions were directed toward one's self (Dorahy et al., 2013). These results and observations being strongly related to symptoms described at DSOs is argued to provide a useful consideration for the underlying mechanisms of their development and relation to core PTSD.

Prior research has likewise shown that self-blame traits and behaviours related to traumatic stressors, such as sexual assault victimisation, are associated with increased PTSD symptom severity (Bub & Lommen, 2017). It is argued that this evidence supports a hypothesised causal role of self-directed guilt in the development of severe PTSD symptoms (Bub & Lommen, 2017). Kline, Berke, Rhodes, Steenkamp, and Litz (2018) contrast this conclusion however with findings from a longitudinal study with sexual assault survivors. These results similarly showed that initial self-blame measured at first assessment predicted PTSD symptoms at one month post-assessment, however no association was found two months and three months post initial assessment. Self-blame at latter time point was however predicted by previous PTSD symptomology with those report great symptom severity more likely to engage in self-blame (N. K. Kline et al., 2018). These results support the conceptualisation of self-blame as both a predictor and as an associated outcome of PTSD.

N. K. Kline et al. (2018) posit that negative self-directed cognitions contribute to the development and maintenance of PTSD symptoms. This has important implications for the DSO dimension; Negative Self-Concept. Such negative beliefs about one's self and negative targets cognitions may serve to maintain and exacerbate PTSD symptoms, hence leading to a chronic C-PTSD syndrome. Moreover, PTSD has historically been recognised as highly comorbid with depressive disorders and comorbidity cases noted for chronic symptomology and greater distress and impairment (Shalev et al., 1998). Negative beliefs about one's self and environment is central to concepts of depression (see Beck & Alford, 2009) and is supported by empirical evidence (Gara et al., 1993).

Further to this, an examination of the trajectories of treatment seeking veterans demonstrated that depressive and anxiety symptoms were significantly associated

with increased likelihood of treatment resistance (D. Murphy & Smith, 2018). These results showed that there are profiles of PTSD with cognate depressive and anxious symptoms that are chronic and resistant to intervention. These comorbidities may be reconceptualised as DSO or C-PTSD symptoms that are functionally distinct from other PTSD diagnoses. The authors argue that these findings prompt the conclusion that there may be profiles of PTSD pathology that warrant different treatment considerations (D. Murphy & Smith, 2018). Given the conceptual similarity of the profiles found and C-PTSD there is a need to explore the viability of this diagnostic category in capturing these presentations (D. Murphy & Smith, 2018).

Interpersonal Difficulties

The second DSO issue considered is *Interpersonal Difficulties/Disturbances;* difficulties in forming and maintaining quality social relationships (Cloitre et al., 2013). It is argued that the symptoms of PTSD and the distress that they may cause relate to this DSO construct as an additional form of impairment (Cloitre et al., 2013; Maercker et al., 2013).

As previously discussed, Complex Trauma is often interpersonal in nature. Researchers have argued that prolonged experience of interpersonal and abusive trauma may be internalised and lead to maladaptive social and interpersonal skills and strategies (J. P. Price, 2007). This experience may also lead to unsecure attachments among both adults and children (Cook et al., 2005; Woodhouse et al., 2015) manifesting as chronic interpersonal difficulties as specified by C-PTSD criteria. These mechanisms are argued to result in an aversion to engaging in social relationships and interaction, and this behaviour becomes the codified characteristic of this DSO domain.

Post-trauma social support is among the factors most associated with PTSD symptomology acting as a protective factor (Brewin, Andrews, & Valentine, 2000; Woodhouse et al., 2015). Research conducted with individuals exposed to *polyvictimisation* in childhood and adulthood has shown positive social support to be

associated with lower odds of developing PTSD symptomology (Schumm, Briggs-Phillips, & Hobfoll, 2006). The same study found that those endorsing repeated victimisation were significantly more likely to possess perceived low social support (Schumm et al., 2006). These results suggest that those who experience multiple stressful experiences, i.e. Complex Trauma, are more likely to be at risk of more chronic PTSD symptomology.

This DSO symptom is likewise argued to intersect with other aspects associated with C-PTSD exacerbating and maintaining symptoms and impairment (Cloitre, Miranda, Stovall-McClough, & Han, 2005). Evidence supports that interpersonal connectedness, or feeling close and satisfied with personal relationships, is highly predictive of chronic post-traumatic mental ill-health (Dorahy et al., 2009). Consequently, Interpersonal Difficulties may be considered a manifest symptom of C-PTSD, as well as a factor contributing to its complexity and chronicity.

Affect Dysregulation

The final DSO construct considered is *Affect Dysregulation*, characterised by emotional hyper-activation, and hypo-activation or emotional numbing (Cloitre et al., 2013, 2018). Such manifested difficulties in emotional regulation are more commonly observed among survivors of childhood abuse and trauma, possibly due to maladaptive cognitive strategies as discussed previously (Cloitre et al., 2005).

As with the other DSO symptoms discussed, difficulties in emotional regulation are recognised components of other mental health disorders, many of which have historically been considered highly comorbid with PTSD such as depression and anxiety (Ford & Courtois, 2014). It has been argued that affect dysregulation is such a commonly observed associated symptom with PTSD that it may be erroneous to think of it as co-occurring but as part of another diagnosis, prompting its inclusion in C-PTSD criteria (Brewin et al., 2017). It is argued that emotional regulation difficulties are manifested in erratic moods as described but also as dissociative and somatic

symptoms which have long been reported as comorbid issues with PTSD (Cloitre et al., 2011).

Evidence primarily supports the manifestation of affect regulation difficulties among survivors of childhood Complex Trauma, possibly due to developmental disturbances (Cloitre et al., 2009; Cook et al., 2005). It should not be concluded however that such emotional dysregulation is not an exclusive result of early exposure to Complex Trauma as multiple and prolonged traumatic exposure is considered to similarly disrupt affect regulation strategies in adulthood (Cloitre et al., 2009; Courtois, 2004). The theoretical pathways previously discussed particularly related to this symptom outcome are the psychological theories chiefly; the development of fundamentally maladaptive cognitive coping strategies following Complex Trauma exposure (Cook et al., 2005; Williams, 2006). Indeed, it is argued that the affect dysregulation domain poses a unique challenge for the treatment of C-PTSD as this factor is often associated with poorer prognosis and greater treatment resistance (Ford, Courtois, Steele, Hart, & Nijenhuis, 2005). This highlights the importance of consideration of this DSO domain in understanding and treating C-PTSD.

Further to this, Cloitre et al. (2005) argue that emotional dysregulation, in addition to interpersonal difficulties, serves to maintain other C-PTSD symptoms and functional impairment. Indeed, the same paper analysed the effect of these domains, in addition to core PTSD symptoms, on functional impairment among female survivors of childhood abuse. It was concluded that *Affect Dysregulation* and *Interpersonal Difficulties* together contributed as much to impairment as recognised traditional PTSD symptomology (Cloitre et al., 2005). This further highlights the clinical significance of DSO symptoms in PTSD presentations and posits a mechanism by which these confer a differentiated post-traumatic aetiology.

Conclusion

It is therefore evidenced that there are historic and contemporary empirical documentations of symptomology profiles consistent with ICD-11 C-PTSD in the form

of comorbid presentations. This sub-section and evidence presented provides theoretical basis for the interaction of Complex Traumatic exposure and the DSO symptoms that are integral component of C-PTSD criteria. These issues appear to be reliably observed across diverse populations, however given the newly codified nature of the ICD-11 C-PTSD diagnosis there is a need to consider robust measurement of its criteria.

1.5.3 Measurement of C-PTSD

Many prior investigations published have utilised proxy measures to establish the theoretical facets of C-PTSD. For example, Palic et al. (2016) utilised items from the Structured Interview for Disorders of Extreme Stress (SIDES) to measure C-PTSD symptoms. Many other studies employ use of items or subscales adapted from established psychometrics that measure similarly defined constructs (Cloitre et al., 2005; Dorahy et al., 2009). This approximation of DSO symptoms provides a useful indication for the purposes of this examination of the C-PTSD construct however to unify research under a unified definition and concept the use of a common or universal measure of C-PTSD is preferable.

The codified measure developed for use with the ICD-11, the *International Trauma Questionnaire* (ITQ*;* Cloitre et al., 2018), provides an opportunity to address a key limitation of much of the existing literature in this area of research allowing for consistent study and comparison of C-PTSD across studies and populations. The current investigation included the most current iteration of this measure available while under development at the time of study commencement, Version 1.5.2 (Cloitre, Roberts, Bisson, & Brewin, 2015). This version consisted of a total of 23 items; seven of which measure core PTSD symptomology based on criteria outlined for the ICD-11, and 16 items which measure the so called DSO symptoms which differentiate C-PTSD symptomology. In order for an individual to receive a diagnosis of C-PTSD they must first meet the criteria for diagnosis of PTSD; presence of at least one symptom in each of three clusters, in addition to reaching a cut-off score on each

of the three aforementioned DSO subscales (*Affect Dysregulation*, *Negative Self-Concept*, and *Interpersonal Difficulties*).

The finalised version of the ITQ (Cloitre et al., 2018) has since been validated with 18 items; six measuring PTSD as defined by the ICD-11, two items per symptom, and six characteristic of DSO, two per DSO symptom, comprising the criteria for C-PTSD classification. These are accompanied by six items measuring symptom-related functional impairment; three per sub-scale. Research to date has systematically validated the psychometric properties of this measure in general population and treatment seeking samples (Cloitre et al., 2018; Shevlin, Hyland, Roberts, et al., 2018). Despite this, there is a noted lack of evidence validating this measure among service personnel and veterans with a single known study to attempt this (Mordeno et al., 2019). There is a proposed need for further validation of C-PTSD and its corresponding measurement and the population of the current investigation is argued to qualify an apt case for this owing to the unique context in NI.

1.6 The Northern Ireland Context

NI represents a unique context of studying psychiatric ill-health owing to the legacy of 'The Troubles'. 'The Troubles' was a period of ethno-religious conflict within NI where Unionist/Loyalist forces, those who believe that NI should remain part of the United Kingdom, were engaged in a prolonged period of guerrilla conflict with the Irish Republican Army, who believed in the reunification of NI with the Republic of Ireland (Armour, Walker, et al., 2017). This conflict spanned several years and lead to the deaths of over 3,600 people; paramilitary combatants, security forces, and civilians, between 1968 and 1998 (BBC, 2018b). Following growing tensions and civil disorder in London/Derry the UK government elected to deploy the Armed Forces to carry out security related duties and support the police force in maintaining the rule of law. This military action, dubbed Operation Banner, was launched in 1969 and was officially retired in 2007 (Oliver, 2007).

The World Health Organisation's World Mental Health Survey (WHO-WMHS) conducted across WHO countries using comparable methods allows for comparison of common mental health disorder prevalence rates using nationally representative samples (Kessler et al., 2009). It was found that NI displayed the highest prevalence [3.8%] of DSM-IV classified PTSD symptomology in the previous 12 months of any participating nation (Karam et al., 2014) and the lifetime incidence of CMDs were significantly elevated for those who had experienced conflict related stressors (Bunting, Ferry, Murphy, O'Neill, & Bolton, 2013). These findings highlight the unique contextual issue that mental ill-health, particularly PTSD is in NI. This is attributed in part to the civil conflict in the region (Bunting et al., 2013).

Operation Banner remains the longest continuous military activity conducted by the British Armed Forces and despite being officially disbanded in 2007 conflict and threat to personal security remains an issue over a decade later (Nolan, 2018). Operation Banner notably involved service personnel recruited locally within NI in addition to forces from English and Scottish regiments. These service personnel lived in the community often serving on a part-time basis in the Ulster Defence Regiment (UDR) and Royal Irish Regiment (RIR). These local regiments were expected to live and serve within the same communities or those near-by which potentially

perpetuates feelings of perceived threat in the individual's day to day lives. This circumstance is unique to those who served locally in the armed forces within NI and have attempted to reintegrate into NI society.

Guerrilla or insurgent combat techniques, such as that employed in NI and in other modern conflicts, is argued to put combatants at increased risk of negative mental health outcomes (Drescher & Foy, 2008). Research has indeed shown this style of insurgent combat that is heavily associated with negative mental health outcomes for persons [combatants] active in such a conflict (Drescher & Foy, 2008). In concurrence, Green et al. (2016) found among Iraq and Afghanistan veterans exposure to 'asymmetric engagement' or guerrilla tactics was associated with over twice the likelihood of developing PTSD. Iribarren, Prolo, Neagos, and Chiappelli (2005) noted that approximately 30% of treatment seeking veterans in the US experience chronic or 'complex PTSD' as a result of the prolonged exposure to threat, insurgent or ambush attacks, during deployment. This has particular implication for military veterans in NI due to the similar nature of conflict during 'The Troubles', suggesting this group to be at heightened risk of more adverse psychopathological outcomes.

The nature of warfare and experiences in the context of the NI conflict has particular implications, specifically for those former part of the UDR or RIR who remain in NI. These *home service* regiments may be at particular risk as individuals lived within their operational theatre leading to pervasive threat to personal security for prolonged periods of time. There are notable instances of off-duty threat to service personnel during 'The Troubles' (BBC, 2018a) with threat of violence continuing to be an issue (BBC, 2005). Solomon, Dekel, and Mikulincer (2008) discuss the potentially detrimental impact of domestic terror and violence as this acts as a reminder of war-zone experiences for veterans particularly where contexts bare similarity to prior traumatic events. Within the context of NI as conflict and attack continue there is hence a risk of re-traumatisation of this group and worsening psychological outcomes. Within this thesis this is conceptualised as a potential Complex Traumatic experience, and as such a risk factor for C-PTSD.

The British Armed Forces have been operationally active in 11 conflicts since WWII, including Operation Banner in NI. A significant number of veterans living in NI may hence have not served in the unique context of the home services (i.e. UDR/Royal Irish Regiments) but however potentially have and do experience the lasting social/societal effects of the conflict. It has been noted that there exists a pervasive culture of sectarianism, division, and violence within NI stemming from the long-standing conflict (Farrell, 2015). It may be argued that this sentiment in the wider population contributes to the perceived stigmatisation reported by some veterans (Armour, Waterhouse-Bradley et al., 2017).

As previously discussed a number of former service personnel have been killed in NI after leaving the armed forces (BBC, 2005). The Police Service of Northern Ireland [PSNI] estimate that since the cease fire declaration in 1998 there have been 158 'security related' killings in NI (Nolan, 2018). These figures demonstrate the continuing activity of Loyalist and Republican paramilitary factions and that there still exists potential danger, or the perception of such, to service personnel and veterans from these groups. Indeed, it is reported that veterans in NI experience hypervigilance in relation to places and reminders of their service during The Troubles (Bradfield, 2018).

This issue is further highlighted as veteran status has been omitted from public and social research in NI. For example, the Annual Population Survey of Armed Forces where questions related to veteran status were not asked due to 'security concerns' (Ministry of Defence, 2017). This further highlights the difficult nature of research with this group and its hard-to-reach nature.

Research conducted with trauma exposed and enslaved women and girls found that perceived social rejection or stigmatisation significantly mediated the relationship between trauma and depressive symptoms, however the same was not found for PTSD symptomology (Ibrahim, Ertl, Catani, Ismail, & Neuner, 2018b). These results suggest that life stressors following trauma and community reintegration may play a significant role in the development of psychopathology. In the case of NI military

veterans this finding may be extrapolated to infer increased risk of mental ill-health for this group. It is reported that veterans in NI perceive themselves to be stigmatised and at risk of attack by others in the community (Armour, Waterhouse-Bradley et al., 2017; Halliday, 2018; Nolan, 2018) and that there is an inherent distrust of others outside of those who served in the Armed Forces (Bradfield, 2018).

A qualitative study conducted with Canadian military veterans found that the concepts of 'identity' and a reconciliation of purpose after leaving the military were centrally important for effective transition to civilian life (Keeling, 2018). The loss of social/cultural identity was seen by veterans and a serious barrier to transition and was associated with psychological distress. Further to this, research has shown that concealing or being unable to express aspects of one's identity due to anticipated stigma is associated with decreased health and well-being for marginalised groups (Quinn & Chaudoir, 2009). These findings have implications for veterans living in NI as veterans and service personnel hide their identity due to security concerns (Armour, Walker, et al., 2017).

Dorahy et al. (2017) conducted a study examining the role of shame and dissociative symptoms in the presentation of C-PTSD in a variety of populations, including treatment-seeking individuals exposed to political violence in NI (N = 65). Of this group it was found that 73.8% met diagnostic criteria for C-PTSD using the Stress Reactions Checklist for Disorders of Extreme Stress (SRC; Ford, Hawke, Alessi, Ledgerwood, & Petry, 2007) as a proxy measure. It should however be noted that this study applied the myriad definition of complex PTSD and not the ICD-11 defined diagnostic construct. Despite this, these results are argued to highlight the potential for C-PTSD to constitute an issue within the NI context and that this warrants further investigation.

In addition to this, Kazlauskas et al. (2018) discussed the relevance for study of PTSD and C-PTSD in Lithuania owing to the post-Soviet context of this nation. It is argued that pervasive trauma and political oppression intrinsic to prior context constitutes a unique risk for development of PTSD and C-PTSD in Lithuania. The current study likewise applied such a rationale to the study of C-PTSD in NI owing to the context of prolonged civil conflict and threat. Furthermore, research has shown that '*Contextual*

Trauma'; traumatic exposure en-masse affecting a number of individuals at the community or population level, may partially explain epidemiological rates of PTSD (Armes et al., 2019). Armes et al. (2019) further note that contextual mass trauma may be prolonged or pervasive in nature lacking pre- and post-traumatising phases which may complicate psychopathological symptom development and maintenance. The compounding effects of multiple and prolonged traumatic experiences in Contextual Trauma may hence be argued to be consistent with the definition of Complex Trauma, suggests C-PTSD somatology may be a potential outcome of such experiences (Courtois, 2012; Dorahy et al., 2013).

Many of the factors relating to contextual stressors, stigma, and heightened threat perception discussed herein additionally contribute to methodological considerations in the design and administration of research with this group. These considerations are discussed in the following sub-section through the lens of *hard-to-reach population* research.

1.7 Hard-to-Reach Populations

As stated, social issues military veterans in NI may be considered to qualify this group as a hard-to-reach population, groups which possess characteristics that make engagement with research and public participation more difficult (Ellard-Gray, Jeffrey, Choubak, & Crann, 2015). Ellard-Gray et al. (2015) provided examples of such characteristics as being; *Hidden*, not easily identified as part of their group, *Elusive*, guarded or concealing their identity as part of their group, and *Excluded*, socially stigmatised or disenfranchised due to group membership.

Research involving hard-to-reach populations is intrinsically difficult and are limited necessarily by the lack of population level information about the study sample (Sydor, 2013). It is nevertheless important to address such issues as one may fall victim to the *McNamara Fallacy*; measuring what is easily measured and electing to disregard the rest (Basler, 2009). This fallacy so named due to the methodological flaws of the body count during the Vietnam war that lead the US to believe that the Viet-Cong were a small group and ultimately led to poor strategic decisions and the ultimate defeat of the US in Vietnam (O'Mahony, 2018). In psychological research where phenomena are complex or elusive this may lead to under-investigation or the conclusion that these are not of great importance to understanding. It is argued that without proper acknowledgement and purposeful measurement of hard-to-reach populations the same fallacy is committed, neglecting to understand experiences of potentially under-served populations.

There are several barriers to engaging in research with hard-to-reach populations such as; concerns over group-based stigma, distrust of researchers, personal risk associated with identification, and access/availability issues (Ellard-Gray et al., 2015). It is hence unsurprising that it is frequently reported that populations defined as hard-to-reach are frequently unlikely to engage in social research and are difficult to *reengage* with research projects at follow-up time points (Bonevski et al., 2014). Compounding this previous research with special occupational groups such as the police and military have found there exists a considerable perceived peer stigma and self-stigma against declaring mental ill-health and seeking treatment (Sharp et al.,

2015; Velazquez & Hernandez, 2019). For these reasons it was anticipated that there may be intersected cultural and personal barriers to participation.

Bonevski et al. (2014) further note that review of 116 studies and 31 reviews of previous research conducted with hard-to-reach groups highlight that research targeting such groups is likely to incur more time and material resource costs. Strategies such as trust-building, engagement with community groups and gate-keepers, and building foundational knowledge of the target population are essential to ensure engagement and to bolster response rates (Bonevski et al., 2014).

The methodology and recruitment strategies applied in this project are hence informed by this prior evidence and are designed in accordance with this populations' characteristics to widen access as much as possible (see *Chapter 2.5.2; Promotion and Recruitment*).

1.8 Research Aims

The extant literature contributes to understanding of the potential psychological health and well-being outcomes of the military veteran population living in NI. The current investigation intends to examine C-PTSD among those veterans living in NI, regardless of serving in The Troubles or other conflicts/roles. The literature discussed herein provides a rationale for investigation of this population, and of the nascent concept of C-PTSD as described by the ICD-11. The stated aims of the current investigation are as follows;

i. To validate the concept and measurement of C-PTSD as described by the ICD-11 within this population. (*Chapters 3 & 4*)

ii. To empirically examine the pathology and aetiology of C-PTSD within this population. (*Chapters 5, 6 & 7*)

iii. To synthesise the findings of this investigation, and to critically evaluate how these contribute to current empirical understanding of C-PTSD. (*Chapter 8*)

Chapter 2.0;

Methodology

2.1 Study Design

This study was part of the first comprehensive quantitative research programme examining the health and well-being of military veterans living in NI. The British Armed Forces definition of a veteran was applied to participants; requiring them to have served at least one day in the British Armed Forces. The target population was inclusive of former service personnel that served during 'The Troubles' as part of the UDR and Royal Irish regiments, veterans of other conflicts outside of NI, and those who had never been deployed. The core requirement being that participants should be residing in NI at the time of survey completion. This survey instrument was developed in response to the research aims outlined in the previous chapter and is used to address them.

Quantitative survey methods are highly regarded for information gathering in the social sciences and often fills a confirmatory role to prior observational or qualitative work (Sieber, 1973). There are two typical methods of administration for surveys; pen-and-paper and online, these are usually distributed via post, e-mail, and manual circulation (Cobanoglu, Moreo, & Warde, 2001). Online survey methodology has grown in popularity among researchers attributed to lower cost, being less resource intensive, and allowing for more streamlined data entry and processing (Granello, & Wheaton, 2004). Granello and Wheaton (2004) further note that online survey methodology allows for data collection from a wider pool of potential participants and allows for greater ease of survey distribution. Additionally, Duncan, White, and Nicholson (2003) note that the application of online survey methodology is particularly appropriate for use with hard-to-reach populations as it offers a low-cost method of discovery for group members who would otherwise be difficult to engage and would not self-identify.

This is not a ubiquitous advantage, however, as a review of prior research in to the effects of survey delivery medium on response rate has also shown that web-based surveys may have up to a 37% lower response rate compared to paper-based

questionnaires (Nulty, 2008). Nulty (2008) noted that although trends within the literature indicate that online surveys receive fewer responses than paper-based surveys there is still considerable variability in findings. For example, identified in the same review Watt, Simpson, McKillop, and Nunn (2002) found a negligible [<1%] difference in response rate to a course feedback survey online or in print.

This study constitutes a secondary data analysis, fitting in a wider programme of research between 2016 and 2019 termed the Northern Ireland Veterans Health and Well-being Study (NIVHWS). The overarching aim of this programme being to quantify the veteran population living in NI, to examine existing service provision, and to examine the current and future potential health related needs of this group. This study and thesis, as a component of NIVHWS programme of research, aimed to specifically examine the mental well-being of this population with a particular focus on the role of C-PTSD as proposed for inclusion in the ICD-11 (Cloitre et al., 2013, 2018; Karatzias, Cloitre, et al., 2017; Maercker, Brewin, Bryant, Cloitre, van Ommeren, et al., 2013). At the time of this study's inception the movement to included C-PTSD in the upcoming ICD-11 had gathered interest among psychologists aiming to understand the structure and correlates of this disorder (see Hyland, Shevlin, Fyvie, & Karatzias, 2018; Knefel et al., 2018). A limited number of studies examining the potential for C-PTSD among adults and military veterans (e.g. Wolf et al., 2015) were noted as particular rationale to examine this construct.

Given the emerging nature of research in this area there is a lack of defined measurement instruments intended to capture C-PTSD with many previous studies using a composite of existing measure of PTSD and cognate symptomology to that described by J. L. Herman (1992). At the time of commencement however a measure of ICD-11 C-PTSD was under development and validation, The International Classification of Diseases Trauma Questionnaire (ICD-TQ; Cloitre, Roberts, Bisson, & Brewin, 2015). Following substantial validation and revision this measure was finalised and published free to use under the revised name; the International Trauma

Questionnaire (ITQ; Cloitre et al., 2018). This finalised version used in analyses is detailed in *Appendix 2.1*. This scale is intended for clinical and research use in the assessment of C-PTSD and seeks to contribute a cross-cultural and population evidence-base for inclusion of this diagnostic category in the ICD-11 (Karatzias, Cloitre, et al., 2017). For this reason, it was decided that the ITQ should be examined to assess its utility to measure C-PTSD among the military veteran population in NI and extend the literature base regarding C-PTSD in adult populations.

Study Procedure

All procedures and methods for the current investigation were reviewed and approved by Ulster University's School of Psychology Ethics Filter Committee and the University Research Ethic Committee (UREC), and affirmed by the Queen's University Belfast Engineering and Physical Sciences Research Ethics Committee (see *Appendices 1.0 and 1.1*). This study fits as part of the larger NIVHWS programme of research focusing specifically on the concept of C-PTSD and therefore makes use of a secondary analysis of the data collected.

As this investigation forms the basis of the first quantitative data collection effort among military veterans in NI a substantive design and development procedure was undertaken. The *Survey Development*, *Design* and *Administration* are detailed in the following respective subsections of this chapter.

2.2 Survey Development Phase

Relevant topics for investigation were selected from prior scoping and qualitative work conducted by the NIVHWS (C. Armour, Walker, Hall, & Ross, 2018; C. Armour, Walker, Waterhouse-Bradley, Hall, & Ross, 2017). A review the extant literature concerning military veterans and the general populations of the UK and NI was also used to identify potentially important issues and appropriate corresponding measures. In addition, the content and measures of recent large-scale wellbeing surveys in veteran populations in the US, Canada, and UK were considered to ensure consistency with the wider literature. A preliminary list of relevant topics was synthesised based on relevance with respect to the NI veteran population due to the dearth of empirical literature directly relating to this population. These topics were discussed and finalised by the research team for inclusion based on their merit to the overall aims of the study and their consistency with the body of literature regarding military veterans and the NI population. Agreed upon topics were organised thematically into 9 broad sections (see *Table 2.1; List of Construct Measures in Order of Survey Structure).*

The survey measure was acknowledged to be particularly long during development. However, as discussed in the previous chapter (*Chapter 1.7; Hard to Reach Populations*) evidence has shown that hidden or elusive groups are difficult to engage and to re-engage in research (Bonevski et al., 2014). It was decided that, as this marked the first opportunity for empirical data collection with this group, the benefit of comprehensive data collection at this time outweighed the disadvantages associated with longer surveys. The most typical disadvantage of longer social surveys being participant drop-out or disengagement (Kalantar & Talley, 1999).

There were also methodological concerns regarding the sensitive nature of the topics of investigation, and potential security concerns associated with the study population. This meant that data linkage procedures with historic or future datasets would not be ethically permissible. For this reason, the research team agreed that

the increased length of the survey was appropriate. Addressing as many topics as possible on this occasion is advantageous as resources and infrastructure are likely to be unavailable to extend data collection to this group in the near future.

The topics/constructs selected were divided into 9 sections in the final version of the survey as follows;

Section A	*Background Information*	*(Demographic & Household Information)*
Section B	*You and Society*	*(Personal welfare, Help seeking behaviours and barriers to care)*
Section C	*Stressful Events and Your Health*	*(Physical health rating, Stressful life events, PTSD, Post traumatic growth and adverse childhood experiences)*
Section D	*Military Experiences*	*(Combat Exposure, Military to civilian life questionnaire, Military experiences)*
Section E	*Health*	*(Anxiety, Depression, Dissociation, Eating Disorders, diagnoses)*
Section F	*Lifestyle*	*(Sleep, alcohol abuse, Drug abuse, smoking, problem gambling. expectations regarding aging)*
Section G	*Coping*	*(Coping strategies, Resilience)*
Section H	*Relationships*	*(Social support, Relationship attachment, relationship satisfaction, Intimate Partner violence)*
Section I	*Other*	*(Any other issue(s) not addressed)*

2.3 Measures & Survey Structure

The following section details the structure of the data collection instrument used and details the psychometric measures used for each construct as part of this questionnaire. *Table 2.1* below details the contents of the survey and the measures contained therein;

Table 2.1; List of Construct Measures in Order of Survey Structure

Section	Topic or Construct	Measure Used
A	Demographic Information	Bespoke Inventory
B	Personal Welfare	Bespoke Inventory
	Impact of Military Status & Service	Bespoke Inventory
	Veterans' Centre Opinions	Bespoke Inventory
	Barriers to Care	Items adapted from Hoge et al. (2004) and Brown, Creel, Engel, Herrell, and Hoge (2011)
	Attitudes Toward Mental Health Services	Attitudes Toward Seeking Psychological Professional Help-Short Form (ATSPPH; Fischer & Farina, 1995)
C	Physical Health Rating	Veterans Rand Health survey (VR-12; Jones et al., 2001)
	Stressful Life Events	Stressful Life Events Screening Questionnaire (SLESQ; Goodman, Corcoran, Turner, Yuan, & Green, 1998), and items adapted from the Life Events Checklist for DSM-5
	Post-Traumatic Stress Disorder	(Gray, Litz, Hsu, & Lombardo, 2004) PTSD Checklist for DSM-5
	Post-Traumatic Growth	(PCL-5; Weathers et al., 2013) Post-Traumatic Growth Inventory Short Form (PTGI-SF; Cann et al., 2010)
	(Complex) Post-Traumatic Stress Disorder	International Trauma Questionnaire (V. 1.5.2) (ITQ; Cloitre et al., 2015)
	Suicidal Ideation	Items adapted from NI Study of Health and Stress (Bunting, Murphy, O'Neill, & Ferry, 2012)
	Adverse Childhood Experiences	Adverse Childhood Experience Questionnaire (ACE-Q; Felitti et al., 1998)

Continued on next page

Section	Topic or Construct	Measure Used
D	Combat Exposure	Combat Exposure Scale (CES; Keane et al., 1989)
	Military to Civilian Life Questionnaire	Military to Civilian Life Questionnaire (M2C-Q; Sayer et al., 2011)
	(Un)Desirable Military Experiences	Items Adopted from Aldwin, Levenson, and Spiro (1994)
E	Anxiety	Generalized Anxiety Disorder Questionnaire (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006)
	Depression	Patient Health Questionnaire (PHQ-9; Kroenke, Spitzer, & Williams, 2001)
	Dissociation	Dissociative Symptoms Scale (DSS; Carlson et al., 2018)
	Eating Disorders	SCOFF Questionnaire (SCOFF; Morgan, Reid, & Lacey, 1999)
	Anger	Dimensions of Anger Reactions Scale (DAR-7; Forbes et al., 2014)
	Health Diagnoses	Bespoke Inventory
F	Sleep Disorder	Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989)
	Alcohol use	Alcohol Use Disorder Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, Monteiro, & Others, 2001)
	Smoking	Fagerstorm test of Nicotine Dependence (FTND; (Heatherton, Kozlowski, Frecker, & Fagerstorm, 1991)
	Gambling	Brief Biosocial Gambling Scale (BBGS; Gebauer, LaBrie, & Shaffer, 2010)
	Drug Abuse	Drug Abuse Screening Test (DAST; Skinner, 1982)
	Expectations Regarding Aging	Expectations Regarding Aging Survey (ERA; Sarkisian, Steers, Hays, & Mangione, 2005)
G	Resilience	Conor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003)
	Coping Strategies	Brief COPE Scale (Carver, 1997)

Continued on Next Page

Section	Topic or Construct	Measure Used
H	Relationship Attachment Style	Relationship Questionnaire (RQ; Bartholomew & Horowitz, 1991)
	Relationship Assessment/Satisfaction	Single Item Measure
	Intimate Partner Violence	Items Adapted from Adult Psychiatric Morbidity Survey (APMS 2014; (McManus, Bebbington, Jenkins, & Brugha, 2016)
I	Miscellaneous	Bespoke Free Response Questions

2.3.1 Survey Section Summaries

Section A Background Information

This introductory portion of the survey captures basic demographic information, such as age, gender, and sexuality. These questions are followed by identification of respondent's service branch, highest rank held, and the duration of their service in both the regular and reserve forces. In addition, a single question asked if participant had served in the UDR or Royal Irish branches.

Section B You and Society

This section posed questions about respondent self-perceived welfare, and experience of healthcare and help seeking as a military veteran. The concepts within this section were largely informed by focus groups completed in a prior component of the NIVHWS (see Armour et al., 2018, 2017) Such topics addressed are; perceived discrimination, knowledge and opinion of the Armed Forces Covenant, and attitudes towards the establishment of a "Veterans' Centre" within NI.

Section C Stressful Events and Your Health

This section assesses previous exposure to stressful and potentially traumatic life events and self-reported health and well-being. Previous research indicates that military veterans who experience PTSD report significantly more physical health

conditions, functional difficulties, and disability than those who do not (Goldberg et al., 2014) hence it was considered important to assess mental and physical health ratings within this section.

General physical health rating is assessed in addition to psychological symptoms, Post-Traumatic Stress, directly associated with stressful life events and in particular the respondents self-selected worst or most stressful experience. This was thought to be a key area of examination as it has been widely reported previously that stressful exposure and health concerns is a topic worthy of investigation among military veterans (Seal, Bertenthal, Miner, Sen, & Marmar, 2007).

Section D Military Experiences

This section gathers information on participant subjective experiences as they reflect on their time in the military and their transition from the Armed Forces to civilian life. This includes questions related to general combat exposure, perceived positive and negative experience during service, and items related to post-service transition experiences.

Section E Health

This section examines the subjective health and well-being of respondents. These questions focus on screening symptoms of common mental health disorders and the receipt of physical and mental health diagnoses from a health professional. The items in this section are drawn from standardised and validated screening instruments based on established diagnostic criteria where appropriate.

Section F Lifestyle

This section poses questions to measure health related lifestyle factors and behaviours of respondents. All behaviours and constructs are measured in relation to

psychopathological criteria using established psychometrics appropriate for the target population. This is done to effectively identify those with problematic or risky health behaviours.

Section G Coping

This section examines the coping strategies and behaviours employed by respondents in dealing with adverse stimuli or events. These constructs include trait resilience as well as typical styles of coping with adverse stimuli or states. The primary motivation for investigation of these factors was to understand psychopathological mechanisms and development.

Section H Relationships

This section focuses on the relationship styles and qualities as perceived by respondents, as well as intimate relationship difficulties and violence. These constructs are shown to be associated with and influence the risk and course of mental ill-health and hence it is of interest in examination of personal well-being (Kaura & Lohman, 2007).

Section I Other

This final section is comprised of free response questions that allow participants to make comments regarding topics that they feel haven't be captured by the survey in relation to: their transition from the armed forces; access to care and support; informal support networks; health and well-being; or anything not mentioned within.

2.3.2 Thesis Investigation

As previously mentioned, this study is a component part of the NIVHWS and many of the measures and constructs present in the survey instrument were not intended for use in this investigation. The inclusion of the wider battery of questions and scales is included to achieve the objectives put forth by the wider NIVHWS. The constructs and measures of interest within the primary analyses of this thesis are; Trauma and Adversity [SLESQ and ACE-Q] ICD-11 PTSD and C-PTSD [ITQ], DSM-5 PTSD [PCL-5], Depression [PHQ-9], Anxiety [GAD-7], Suicidal Ideation. The relevant measurement details of each of these constructs are described more substantively in the respective empirical chapters where they are used. These measures use in thesis analyses are also presented as excerpts from the main survey in *Appendices 2.1* to *2.6*.

There are disadvantages for this study related to this mode of data collection that are acknowledged. For example, greater survey length is associated with higher rates of disengagement and drop-out (Hoerger, 2010; Kalantar & Talley, 1999). Previous evidence has shown that the likelihood of participant drop-out increases in line with number of response items in online surveys (Hoerger, 2010). Due to this it was considered that drop-out and partial missing data on scales may be an issue. Rigorous procedures for estimation of missing data were applied to combat this limitation. It was also argued that this investigations component role within the NIVHWS allowed for additional person and material resources, credibility, and opportunities for promotion that would not otherwise be afforded as a stand-alone research project. As such the collection of data for this thesis investigation within the NIVHWS was considered advantageous as a whole.

Given the large-scale of the wider project, and the ground-breaking nature of the research being the first to investigate veteran health in NI, it was deemed necessary to conduct a feasibility pilot of the data collection instrument. The rationale and process for this phase of development is presented in the following section;

2.4 Survey Piloting Phase

2.4.1 Background

Prior to the launch of the survey instrument a feasibility pilot study was conducted to ensure the appropriateness of the questionnaire and its items for use within the target population. Both the paper-based and web-based versions of the survey were piloted ensure both modes were appropriate. All piloting took place in the presence of one of the researchers involved with the NIVHWS and were hosted within facilities provided by a service provider for the veteran population; the *UDR/Royal Irish Aftercare Service*.

The traditional purpose of pretesting and piloting survey instruments is to evaluate the length of time it takes to complete said instrument, identify disruptions in flow and ensure appropriate administration (D. Collins, 2003). This process is also considered an important part of research project development as it allows the researcher to avoid misinterpretations of items, identify errors in the design or flow of the questionnaire, and to ensure the collection of high quality and reliable data (Bowden, Fox-Rushby, Nyandieka, & Wanjau, 2002). One of the most direct ways to minimise measurement error or poor data is using cognitive methods; examination of the question and answer processes engaged in by participants during completion of the questionnaire (D. Collins, 2003). D. Collins (2003) argues that through a cognitive evaluation of survey response researchers may identify more nuanced difficulties participants may have at the item level of the questionnaire such as comprehension, retrieval of information, evaluation and response. The combination of cognitive interview and researcher observation of participant behaviour is believed to given the most useful pre-test information (Presser et al., 2004),

Further to this, Andrews, Nonnecke, and Preece (2003) note that the implementation of electronic surveys in quantitative research poses unique challenges due to the restrictions and the capabilities this medium offers compared to paper-based questionnaires. It is essential to rigorously pilot the implementation of online surveys to anticipate potential technical issues and to ensure the method is appropriate by pre-testing with a sub sample of the target population (Granello & Wheaton, 2004). Andrews et al. (2003) also noted that there may exist inherent bias in the

administration of online and web surveys as this necessarily excludes certain demographics of potential respondents, i.e. those with poor computer literacy or limited access to technology or the internet. For this reason, it was decided that during piloting the current study would administer and evaluate both a web and equivalent paper-based version of the survey instrument.

2.4.2 Procedure & Analysis

Ten participants were identified to be suitable for this phase of the study in line with previous research examining the usability testing of data-entry instruments (Faulkner, 2003). Faulkner (2003) demonstrated that a sample of 5 participants could identify as few as 55% of errors or inconsistencies with the instrument. This increased to an average of 94.69% identification of known problems for a sample size of ten participants with severely diminished returns beyond this. The sample size selected (N = 10) was efficacious and fit-for purpose.

The methodological protocol put in place for this portion of study was the *Thinking Aloud procedure* (Lewis & Rieman, 1993). This piloting procedure involves having participants complete the research instrument(s) in the presence of the researcher and having them voice aloud their thoughts as they complete the measures. This method of piloting was selected as the most appropriate during the development phase of the survey instrument as it allowed for a flexible application and development process, allowing questions and comments to be addressed by pilot participants on an ad-hoc basis and suggestions to be made based on the intention of the question items in real time. In addition to this, the majority of questions included in the current study were part of psychometrically validated measures and as such there was little rationale for item level discerning of these. It was instead deemed that addressing structural issues and survey flow was the primary goal in this piloting process. Where bespoke items were developed for the current investigation care was taken to ensure that these items elicited the intended understanding for all participants as determined by their comments during completion, a task for which this method of piloting is particularly appropriate (Trenor, Miller, & Gipson, 2011).

Researchers used a second copy of the survey instrument to annotate the thoughts and comments of participants at the relevant stage of completion. Following completion participants were given a comfort break and were asked to complete a brief post-survey interview with the researcher with whom they had completed the survey. This interview asked participants to rate the ease of use and appropriateness of the survey, and the amount of distress experienced by participation. This stage also afforded participants the opportunity to give general feedback reflecting on the survey as a whole and to suggest any areas of improvement or to identify notable omissions. Such use of retrospective probing questions and thinking-aloud procedures in conjunction as in this study are accepted design in pilot studies (D. Collins, 2003) and both approaches are considered effective in cognitive interviewing and pretesting (Priede & Farrall, 2011).

The efficacy of the survey instrument was assessed using *methodological triangulation*. This approach employs both quantitative and qualitative elements of investigation in order to best understand the topic of investigation (Sale, Lohfeld, & Brazil, 2002). In this study mixed methods were used to effectively capture a range of feedback regarding the survey instrument to allow for more effective wording and response options to be used in the final version of the survey (van Teijlingen & Hundley, 2002). Descriptive quantitative data further allowed for a broad evaluation and confirmation of general aspects of the survey instrument. Adopting a mixed-methods approach to piloting is considered to be highly effective for validation and for making well-informed changes and revisions to study design and materials (Nicholson, Wright, & Carlisle, 2018).

2.4.3 Participants

Recruitment for the pilot phase of this study took place through referral from the UDR/Royal Irish Aftercare Service as well as an e-mail distribution to those who had previously registered interest in participating in research conducted by the NIVHWS. All participants asked to travel to one of the satellite offices of the UDR/Royal Irish Aftercare Service located at several locations in NI; Coleraine, Holywood, Portadown

and Enniskillen where they would be met by one of the research team. All participants for this phase were compensated for their time with a £30 Amazon voucher.

2.4.4 Quantitative Results

Basic descriptive and demographic data intended for inclusion in the final survey version were collected for all participants during the pilot phase of the survey. All other responses produced during pilot testing not pertinent to the piloting procedures and review of the survey instrument were destroyed and discarded.

Participant ages ranged from 34 to 66 [*M* = 50.9, *SD* = 8.48], and an equal number of males and females were recruited at this stage [*n* = 5]. The characteristics of individual service experience, i.e. service branch and rank, were also considered and recorded in this pilot to acknowledge that variations in service experience may influence the accuracy or relevance of questions. Full demographic information can be found in *Table 2.2*.

Table 2.2; Demographic Information of Pilot Study Participants

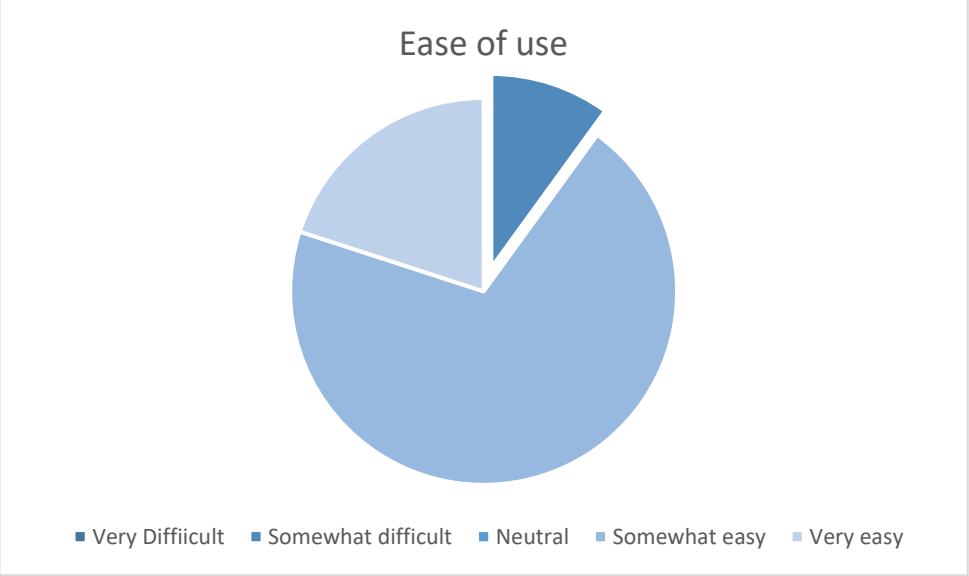
Variable	**N (%)**
Gender	
Male	5 (50%)
Female	5 (50%)
Branch	
Army	9 (90%)
Royal Navy	1 (10)
Rank	
Officer	1 (10%)
Other (Non-commissioned)	9 (90%)
Time in service (Regular)	
0-10 years	3 (30%)
11-20 years	1 (10%)
21-30 years	6 (60%)
Time in service (Reserve)	
0-10 years	8 (80%)
11-20 years	1 (10%)
Refused	1 (10%)
Current reservist	
Yes	4 (40%)
No	6 (60%)

Home Service in Northern Ireland	
Yes	10 (100%)
Medically Discharged	
Yes, Due to physical injury	3 (30%)
No	7 (70%)

Time taken to complete the survey ranged from 99 to 136 minutes [M = 104.5, SD = 18.79]. During completion participants took between 0 and 2 breaks [M = 0.5]). Half of participants completed the paper-based survey [N = 5] while 4 participants completed the web-based survey with 1 participant electing to change the survey mode from online to paper-based due to a technical fault with the tablet computer being used to administer the survey.

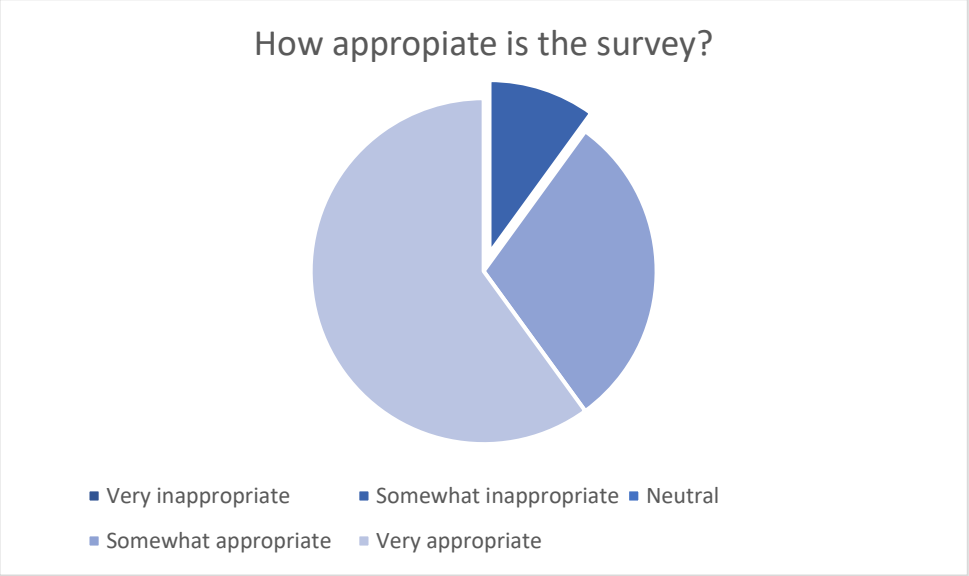
Survey Evaluation took place following completion of the survey measures with participants given the option to take a brief comfort break before this interview. The researcher with whom participants had been completing the survey instrument posed a number of questions rating the ease of use of the survey, how appropriate they perceived this method for the purpose of the study and how much distress (if any) participation had cause them. Results of these questions are presented graphically overleaf;

Figure 2.1; Post survey Question: How would you rate the ease of use of this survey?



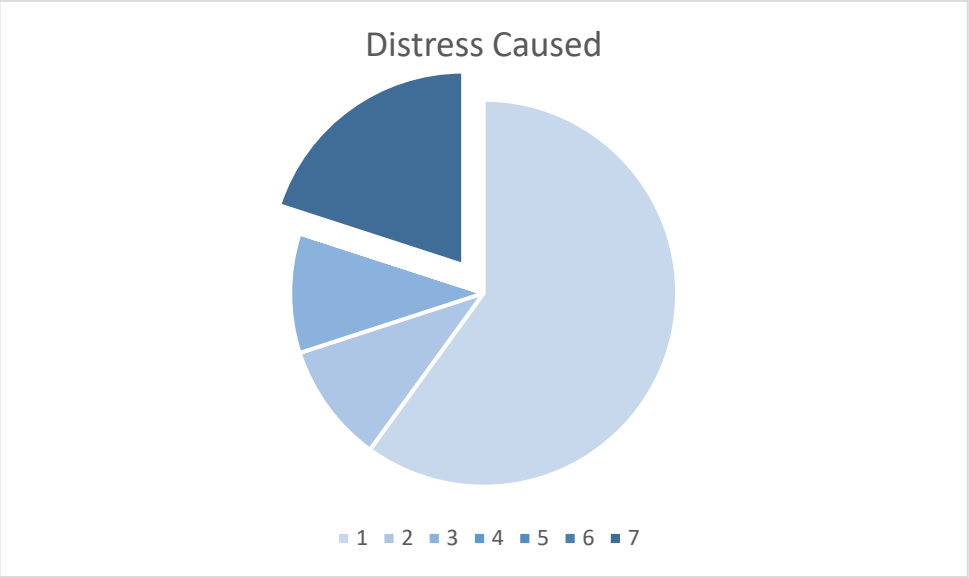
As shown in *Figure 2.1* above, the majority [N = 9] of participants positively endorsed the ease of use of the survey. One participant completing the paper-based survey felt that completion was "Somewhat difficult".

Figure 2.2; Post Survey Question: How appropriate do you think this survey is for its purpose?



As shown in *Figure 2.2* the majority of participants reportedly felt that the use of the survey was either "Very Appropriate" [N = 6] or "Somewhat Appropriate" [N = 3]. One participant negatively endorsed this item reporting the use of the survey was "Somewhat Inappropriate" for the purpose of the investigation.

Figure 2.3; Post Survey Question: How much distress (if any) would you say you have experienced as a result of this survey?



Finally, *Figure 2.3* shows that the majority of participants endorsed experiencing no distress at all [N = 6] with an additional 2 participants endorsing experiencing little or very little distress. Two participants did endorse experiencing a relatively high degree of distress through participation (Rated as 7/10). Following completion of the survey support staff at the Aftercare service were alerted and these participants were offered support from these staff.

2.4.5 Qualitative Results

Survey item feedback was captured as participants proceeded through the survey in accordance with the *Thinking Aloud* protocol. At any point during administration participant were allowed to voice any concerns about the wording or structure of questionnaire items at which point the researcher present would discuss the aspect(s) that cause confusion and take note of participant suggestions of possible rewording to items that would reduce confusion or make them more specific to the target population.

Item level feedback from participant was noted by researchers and collated by the research team following the conclusion of the piloting procedures producing a single document outlining all relevant feedback provided. The research team then

considered and discussed the comments made about potentially problematic or confusing items and reached a consensus on the changes that were deemed appropriate.

An example of item level feedback and revision is exampled below;

Regarding questions about service and reservist status participants felt the original wording and structure would potentially be confusing. To remedy this, demographic questions were revised according to the feedback provided to match language typically used by this group, i.e. terms used for ranks and replacement of the term '*tours*' with '*operational deployments*'.

For some items, such as those in relation to the potential use of a veteran centre and its location, it was suggested by multiple participants to add ambivalent response options such as 'Cannot see a reason not to use' and 'Don't mind' to allow for more accurate representation of their views and hence these were added.

Overall Survey Feedback was also collected during the post-survey interview where participants were asked to provide details of the main positive and negative features of the survey as well as an overall evaluation and opportunity to raise any issues that remained unaddressed within. This data was collected using a post survey interview guide where participants rated the ease of use, appropriateness, and distress caused by completion of the survey as outlined in the previous section. In addition to these quantitative measurements a total of 3 open end questions were posed to all participants. These questions examined the perceived positive features, negative features, and general feedback or if any issues were overlooked.

Some comments raised at this stage were;

Several participants indicated that they felt the survey was too long, however they also remarked on the benefit of the comprehensive nature of the questions. Based on this feedback steps were taken to ensure the briefest psychometric measures

were used and construct measures that could not be solidly rationalised as meeting the objectives of the study upon strict review were removed during revision.

The pilot iteration of the survey contained 'attention checks', questions not intended for analysis but to confirm participants are following question instructions accurately i.e. '*Please respond Partly Agree*', featured at non-uniform intervals throughout the instrument. These items are regularly used in online survey research to ensure the quality of responses as it allows for detection of disengaged respondents and avoid poor-quality data collection (Hauser & Schwarz, 2016). Participants however said they found these questions confusing and they severely disrupted the flow of the survey making it harder to respond. This coupled with contrary precedent indicating attention check questions have relatively limited utility in identifying poor quality responses (M. Liu & Wronski, 2018) led to the removal of these items to streamline the response process.

2.4.6 Limitations

The measures used in this study were not statistically validated within the pilot sample due to the low sample size. It was decided that there was limited utility in this practice as the majority of measures we previously psychometrically validated. Further to this, the current pilot study primarily attempted to validate the cognitive processing and aspects of the current study. This objective was met by the methodology and analyses employed (Faulkner, 2003; Trenor et al., 2011) and was effectively accomplished by completion of the pilot phase.

Secondly, it is important to note that pre-testing does not guarantee identification of all issues present with instruments and hence this limits researcher confidence in data (Presser et al., 2004). It does however offer an improvement in survey development to tailor it to the objectives of the study and to the study population. Given the number of participants and procedures used it is expected that the majority of potential issues are identified through this process (D. Collins, 2003; Faulkner, 2003).

Finally, it is unknown to what degree the sample obtained for the piloting processes may be considered representative of the target study population demographically. At the time of completion, a comprehensive understanding of the military veteran population living in NI and the demographics thereof was not available. There exist some estimates of the number of veterans living in NI, for instance the Royal British Legion (2014) estimate 110,000 veterans currently live in NI. However, these estimates remain unsubstantiated and are not empirically derived. Demographic information is not censused of this group due to difficulty conducting empirical research with this group (Ministry of Defence, 2017). As such the degree to which the sample used is representative of the population in unknown. Despite this, participants recruited has a variety of backgrounds and abilities increasing the likelihood the results of this pilot study be relevant for the wider veteran population. While these data may not be representative of the true prevalence of disorders, they may be used to investigate relationships and mechanisms between psychopathological constructs.

2.4.7 Conclusions

Despite these limitations this feasibility study provides the first evidence-based quantitative instrument for examination of health and well-being among military veterans in NI. This questionnaire is formed using available information from other Armed Forces populations from other nations and inferences from the NI and UK general populations. Moreover, the use of pre-testing or piloting of survey instruments with a sub-sample of the target population is seen as good practice and yield the greatest likelihood of ensuring internal validity of the instrument (van Teijlingen, & Hundley, 2002).

These results informed both major and minor subsequent revisions to the final survey design and administration. Based on participant responses to the survey evaluation questions [see *Figures 2.1* and *2.2*] there was support for the intrinsic design and implementation of the survey instrument with the majority of participants finding it

easy to use and fit for purpose. Based on quantitative and qualitative feedback provided during the pre-testing phase detailed herein the investigation proceeded with the quantitative survey data collection design.

The aforementioned changes, in addition to more minor revisions to the survey flow and the wording of items, were evaluated by the research team. All changes were subject to ethical review and following approach the revised survey was prepared for delivery and promotion during the main survey phase in advance of the official launch in December 2017.

2.5 Main Survey Phase

2.5.1 Procedure

The main survey was launched online December 17th, 2017 and concluded in August, 2019. During the same time prospective participants could also request a paper-based version of the survey by contacting a member of the research team via post, telephone, and e-mail. Assistance with survey completion was also made available on an ad-hoc basis following a codified lone worker policy where a researcher would attend the home or other elected area to assist potential respondents with impairment issues precluding them from self-completion.

Details of the survey were promoted both online, through social media and the NIVHWS official website, and in person through research team invitation and attendance at numerous events orientated toward service personnel and veterans (i.e. Armed Forces Day) during the course of the study's data collection period. Information regarding the study and the on-going survey data collection was also circulated at numerous report launch events and engagements related to the complimentary work packages completed by the NIVHWS. These events allowed for engagement and promotion with key stakeholders, such as service providers and policymakers, who were encouraged to raise awareness of the survey through word of mouth in their individual areas of influence.

Additional information on the promotion of the survey and incentive scheme offered for participation is presented in the following subsections.

2.5.2 Promotion and Recruitment

Promoting the survey as widely as possible was important to increase the odds of reaching the target population. As military veterans in NI may be considered a hidden and dispersed population this was deemed an important process. For this reason, good working relationships with veterans' organisations were built during other work with the NIVHWS ahead of survey administration as researcher mistrust has been shown to be associated with low response rates (Bonevski et al., 2014). Having

recognised support organisations 'vouch' for the research and team members was therefor considered fundamentally important.

A large portion of data collection was anticipated to be conducted online. As previously stated, this method of delivery that is considered to be limited by the potential for poor response rates (Nulty, 2008). This increased the perceived need for an evidence-based promotion and recruitment strategy to avoid this limitation. A strategy for promotion of the survey was co-created by all members of the NIVHWS team in 2017.

Part of the promotion strategy included the issuing of reminders regarding survey completion. Reminders issued have been shown to effectively increase response rate when issued at various stages of data collection with late reminders being shown to be effective in encouraging participation where lottery incentive rewards are offered (Deutskens, De Ruyter, Wetzels, & Oosterveld, 2004). Hence this approach was employed, reminders were issued and promotional events held at various points of data collection to boost completion rates and increase the visibility of the study.

Of note, the provision of alternative methods of completion is likely to increase response rates and reduce non-response bias (Coughlin et al., 2011). For this reason, it was widely advertised through engagement events and promotional materials that in addition to the web-based survey there was a paper-based copy that may be completed as needed or if preferred. In addition, members of the veteran community and representatives from veterans' support organisations identified in a prior review (see Armour, Walker, et al., 2017) were asked to promote the survey offline via word of mouth to capture members of the target population that may not be active online. The survey was also promoted in local traditional media, e.g. newspapers and radio, achieving wider dissemination to those not reached by other recruitment strategies.

Particular consideration was additionally made regarding the hard-to-reach nature of the study population. Strategies for effective participant engagement were designed based on prior evidence and best practices for hard-to-reach groups;

Hard-to-Reach Population Recruitment

There are a number of established methods of sampling and recruitment used with hard-to-reach populations that have been evidenced to be effective. Shaghaghi, Bhopal, and Sheikh (2011) argue however that the most optimised recruitment strategies are informed by and tailored to the target population.

Based on prior experience with the study population and established relationships with veterans' organisations the study applied an *Adaptive Snowball Sampling* technique. Potential participants, representatives and 'gatekeepers' were made aware of the goals and details of the research and encouraged to forward this information via informal and formal channels of in-group communication (Sadler, Lee, Lim, & Fullerton, 2010; Shaghaghi et al., 2011). This approach to recruitment is considered effective in cases where group members are likely to be sensitive to issues of being identified and in contact with other group members (Shaghaghi et al., 2011). This was concluded to be the case with the NI veteran group based on findings from previous NIVHWS research of a formal and informal network of contact between veterans and veteran organisations (C. Armour, Waterhouse-Bradley, et al., 2017).

In addition to this, techniques of *Facility Based* and *Targeted/Space Sampling* were employed (Shaghagi et al., 2011). These methods allow for the recruitment of more specified characteristics of group members, i.e. those engaged with healthcare or welfare Facilities. In the case of the current study, welfare organisations and charities were purposefully engaged in order to effectively represent clinical or help-seeking populations of veterans. Equally, targeted-space sampling was conducted at relevant contexts and event such as Armed Forces Day where it was believed a number of community-based veterans would be present.

In summary, this investigation applied previous knowledge of the target population and evidence-based approaches to engaging hard-to-reach populations to deliver an informed recruitment strategy for use with the target population.

2.5.3 Incentive Strategy

During survey development the potential use of incentives for participation was reviewed. The use of incentives (e.g. providing a token or monetary reward for participation) has been commonplace in the social sciences particularly in cases wherein the researchers wish to encourage greater numbers of respondents (Church, 1993). Evidence has shown the offer of various forms of incentive, monetary and non-monetary, do indeed positively influence response rate to online based surveys (Church, 1993). However monetary and voucher incentives are often seen as a more resource effective incentive offering for researchers and participants (Hsu, Schmeiser, Haggerty, & Nelson, 2017; Pedersen & Nielsen, 2016). It is also considered standard practice within psychological research to use pre-paid gift cards or vouchers in place of cash reward as this avoids potential confidentiality and security concerns arising from obtaining bank details or providing cash (Fan & Yan, 2010).

The two most popular methods of monetary incentive provision are pre-paid incentive, offering a relatively small reward with the invitation to participate, and that of lottery entrance, entry into a prize draw upon completion of participation or return of the survey (Hsu et al., 2016). The efficacy and relevance of these is reviewed below;

Previous studies have widely evidenced the efficacy of prepaid incentives in mail surveys and in web-based data collection (Church, 1993; Fan & Yan, 2010; Goritz, 2004). Hsu et al. (2016) found that a pre-paid incentive of $5 was a more effective incentive for participant than any promised incentive, such as entry into a lottery following completion. However, it should be noted that such pre-paid incentive schemes have the potential to incur a large cost where response numbers are not strictly fixed and may not be logistically viable outside of the fixed number mail-survey context (Church, 1999). Additionally, experimental evidence has shown that although mail surveys have shown pre-paid incentives to effectively increase response rates this is not replicated with web-based surveys (Bosnjak & Tuten, 2003).

Alternatively, there is the incentive of post-survey lottery entry. Prior work examining the efficacy of the nature of incentives demonstrated that in the case of larger

surveys, lottery rewards appear to be the most effective at increasing response rates for longer surveys (Deutskens et al., 2004). Evidence from Kalantar and Talley (1999) further support this as it was found that entry to a lottery prize draw was an effective incentive for completion of a substantial health and behaviour survey as this yielded an increased response rate in the absence of follow-up reminders. Experimental evidence from Bosnjak and Tuten (2003) additionally showed that promised fixed incentives did not increase response rates, however the offer of a lottery incentive did increase the survey completion rate. Another pragmatic benefit of a lottery incentive scheme is that regardless of the number of responses researchers may effectively budget for incentive claim as this figure will be fixed from the beginning of data collection (Church, 1993).

Considering the cost-efficacy of lottery incentives; prior research has shown a more limited number of high value prizes to be a more cost-effective incentive strategy as (Gajic, Cameron, and Hurley (2012) demonstrated in an experimental study that a high value lottery reward [2x $250] was more cost effective than a greater number of lower value rewards [10x $25], and a nominal value pre-paid incentive [$2]. Contradictory evidence is provided by Duetskins et al. (2004) where it was demonstrated that a larger number of low value lottery incentives [10x $25] yielded a higher number of responses when compared to the condition of limited larger reward values [5x $50]. It was speculated that this effect may have been due to participants potentially perceiving a lower value of their participation due to the decreased likelihood of winning. Research has also shown participation rates to increase with the size of lottery prizes offered comparing $50 to $100 and $150 suggesting that higher value winnings may be an effective incentive strategy (Hsu et al., 2016).

A review provided by Fan and Yan (2010) examining the efficacy of incentive and promotion strategies for online surveys highlights that there exists no consensus on the most effective strategies and efficacy often varies between studies and populations. It is advised that researchers use specific knowledge to tailor strategies for incentive provision to the study and population in question.

Implemented Incentive Scheme

Pre-paid incentive provision was deemed inappropriate for the current investigation as the target population is hidden and elusive, as such individual targeted invitations could not be issued effectively. As this well-being survey was intended to be as widely distributed as possible to a population of an unknown size it would have proved logistically very difficult to offer prepaid incentives and been open to abuse. A study conducted in the US examining the effects of various incentives on response rates in the veteran population shown that lottery incentives were associated with greater odds of survey response when compared to a no incentive offered condition [OR = 1.34] (Coughlin et al., 2011). It was therefore decided that given the constraints from the study population and prior evidence highlighting the efficacy of *post-survey lottery incentive* this would be the most effective design for the current study.

There was an allotted budget of £3000 [GBP] provided for incentive provision and in accordance with prior evidence such as that of Gajic et al. (2012) and Duetskins et al. (2004) it was decided that in order to encourage the greatest number of participants a limited number of larger lottery prizes should be offered. This allowance was divided into 18 Amazon vouchers of £150, with the remaining funds used to provide a total of ten £30 Amazon vouchers compensating participants of the pilot phase of this investigation. It was decided that notification of lottery draw winners would take place monthly as draws were made. Previous evidence has shown prompt notification of prize draw results to increase response rates (Tuten, Galesic, & Bosnjak, 2004). As such the prize draws were publicised without winner information as a promotion and reminder of the on-going data collection.

2.5.4 Dataset Administration

As this study was the first empirical investigation of the health and well-being among military veterans living in NI it was felt important to have a robust data administration

and management plan. This investigation produced a large-scale quantitative dataset collected using Qualtrics online survey platform. The dataset was coded prior to data collection using Qualtrics software where advanced options were applied to code responses in accordance with their respective published guidance. For instance, where published psychometrics has specific values corresponding to responses these were prospectively changed. The resulting database remains intended for use in analyses as part of NIVHWS work packages as well as academic analysis and publication. Withdrawal of responses after submission was not possible as data were fully anonymised.

Consent forms

Both the online and paper-based surveys were accompanied by consent forms including a description of the study provided in comprehensible language to allow participants to make an informed decision with regards to participation. Potential participants were informed at this stage that as data were immediately anonymised responses could not be withdrawn once submitted. Participants were asked to indicate their consent by simply 'checking' or providing their initials alongside statements indicating their understanding of the Participant Information Sheet and willingness to complete the questionnaire free from coercion.

In the case that participants declined their consent to the study; did not respond in the affirmative to any statements regard comprehension or consent, or that they were a British Armed Forces veteran the responses were destroyed and not included in analyses. In the case of online responses these respondents were offered thanks and redirected from the survey. All physical consent forms were held in a secure filing cabinet located in the NIVHWS offices.

Data Storage & Retention Protocol

These data are held on a secure sever and are retained for a period of no less than 10 years (December 2030). Data is used in the current investigation in addition to complimenting other work packages associated with the NIVHWS (see Armour, Walker, et al., 2018). Data will be archived and used for the publication of academic papers during the retention period. After this date all data will be securely erased, and destruction will be confirmed to ensure the data cannot be read following the closure of this project. These data are anonymised and are not for distribution beyond the NIVHWS project.

In addition to survey responses participants could volunteer contact information for entry into a prize draw, or to register interest in follow-up studies at the end of the survey. All data retained in relation to prize draw entry as per the incentive scheme was held separately from survey data and in strict confidence. This information was retained separately on a secure server and available only to the research team for the purposes of lottery draw and contacting those interested in further participation.

Thesis Data Analytic Plan

Owing to time constraints, the data used in this thesis were captured from responses submitted to the online survey platform over a period of 12 months; between December 2017 and December 2018. Ethical procedures determined that paper-based responses were to be held securely until the conclusion of the data collection period and as such were not input at this stage.

A total of N = 903 cases were generated by Qualtrics survey software. Of these n = 319 did not provide consent or failed to respond to any survey questions and were excluded. This produced a partially complete dataset comprised of n = 584 cases. Where partial data was found to be available for measures of interest, and assumptions satisfied, missing data was statistically estimated in the interest of preserving the greatest number of cases for analyses. The presence of missing data is considered as failure to account for this may introduce bias to analyses and results

(Dong & Peng, 2013). A general rule applied where cases where missing data exceeded 20% were determined to be excluded. This cut-off offers a level of missing data where values may be robustly estimated by contemporary techniques (Dong & Peng, 2013).

These data were analysed using a variety of methods including latent variable modelling methods; such as Confirmatory Factor Analysis (CFA), Latent Class Analysis (LCA), and Latent Profile Analysis (LPA), and multinomial logistic regression. The statistical software packages used in this investigation were IBM SPSS (v.24) for data screening, inferential statistics, and more basic analyses (e.g. Cohen's Kappa). Mplus 7.3.1 (L. K. Muthén & Muthén, 2015) was used for more elaborate analyse (i.e. CFA, LCA, LPA) as these cannot be conducted using SPSS. Specific details of the missing data procedures and analytic methods used in each study of this investigation are elaborated upon within the methodology sections of their respective chapters.

2.6 Conclusion

This chapter provides an overview of the design and development of the data collection instrument used in this investigation, including feasibility piloting. In additional, the general the procedures used to gather and prepare the data used is detailed herein. The methods and procedures discussed in this chapter correspond to this investigation more globally, where the following empirical chapters highlight and detail more substantially the relevant aspects of methodology and analyses employed as part of that study.

Chapter 3.0;

Confirmatory Factor Analysis of the International Trauma Questionnaire Among Military Veterans in Northern Ireland

3.1 Introduction

The ICD-11 has reconceptualised the diagnosis of PTSD and added a distinct but related diagnosis of C-PTSD (Maercker, Brewin, Bryant, Cloitre, van Ommeren, et al., 2013). This diagnosis exists in addition to that of PTSD, acting as a distinct sibling diagnosis (Brewin et al., 2017). The theoretical structure of ICD-11 PTSD consists of a reduced symptom taxonomy consisting of; Re-experiencing (*Re*), Avoidance (*Av*), and Sense of Current Threat (*Th*) (Cloitre, Garvert, Weiss, Carlson, & Bryant, 2014; Maercker, Brewin, Bryant, Cloitre, Reed, et al., 2013). C-PTSD is contingent on meeting these PTSD criteria in addition to three additional symptoms labelled Disturbances in Self-Organisation (DSO). The DSO symptoms recognised in ICD-11 C-PTSD criteria are; Affect Dysregulation (*AD*), Negative Self-Concept (*NSC*), and Disturbance in Interpersonal Relationships (*DR*) (Cloitre et al., 2009). Prior studies have supported the grouping of these symptom domains into the superordinate PTSD and DSO labels through factor analysis (Hyland, Shevlin, Brewin, et al., 2017). Consistent findings of these latent factors across several studies led to the now codified diagnostic concept of C-PTSD in the ICD-11 (Cloitre et al., 2018).

The three recognised symptom domains of PTSD detailed above are typically regarded as core to the concept, supported by a wealth of prior evidence (Maercker et al., 2013). The addition of a DSO factor comprising additional C-PTSD symptoms stems from consistent clinical presentation of trauma survivors; particularly those of particularly prolonged interpersonal trauma, where affective regulations, self-perception, and difficulties with interpersonal relationships were commonly reported (J. L. Herman, 1992; Maercker, Brewin, Bryant, Cloitre, Reed, et al., 2013). These three difficulties have been consistently observed together by clinicians and reportedly associated with greater distress (Cloitre et al., 2011). Moreover research has statistically supported the differentiation of a unique group experiencing PTSD and DSO symptoms from PTSD symptoms alone lending further support to the C-PTSD concept (Brewin et al., 2017).

It is theorised that the exposure to Complex Trauma results in these disturbances as biological, psychological, and social systems are compromised (Williams, 2006). Where trauma is prolonged or cumulative individuals develop maladaptive behaviours, which are quantified in the three DSO domains. This is consistent with a longer standing tradition in research referring to these symptoms as 'PTSD and its related facets' (Courtois, 2004). Indeed, affective problems and interpersonal difficulties have been shown to explain 50% of PTSD impairment variances among childhood abuse survivors (Cloitre, Miranda, Stovall-McClough, & Han, 2005). This theorised bi-directional relationship between PTSD symptoms and DSO is argued to contribute to particularly severe and chronic symptomatic presentations (Cloitre et al., 2005).

There is therefore well-established evidence from a theoretical and empirical perspective of the proposed C-PTSD symptoms in relation to PTSD pathology (Cloitre, Garvert, Brewin, Bryant, & Maercker, 2013). This evidence prompts confirmatory investigation of the structure and association of symptoms as latent factors in this nascent psychological disorder (S. Murphy, Elklit, Dokkedahl, & Shevlin, 2018). An established statistical technique for examining the relationship and structure of variables that comprise a diagnostic concept is *factor analysis*; examining the relationship between observed variables as indicators of unobserved or latent variables (T. A. Brown, 2015). The following section introduces factor analytic methods and the growing body of evidence regarding the factor structure of C-PTSD.

3.1.1 Factor Analytic Approach

Factor analysis allows for the examination of a potential latent construct or constructs to which many observed variables are linked (Muthén & Muthén, 2012). The specific purpose of *Exploratory* (EFA) and *Confirmatory Factor Analysis* (CFA) is to identify and test the nature of these relationships to the latent factors which exert influence of observed measurements (T. A. Brown & Moore, 2012). Both EFA and CFA aim to create a more parsimonious explanation of the observed measurements by distilling common factors that explain the endorsement of responses.

The EFA approach typically involves the researcher examining the factor loadings of the measurements of interest and simply relying on statistical indices to indicate which 'factor structure' is supported by the data (Brown & Moore, 2012). Alternatively, CFA typically involves the researcher testing theoretically or empirically driven hypotheses of pre-specified factor structures, for example grouping items that are conceptually related, and examining to what degree this theoretical model fits the data (T. A. Brown & Moore, 2012; Hurley et al., 1997). Some researchers however contest that all application of factor analysis is both exploratory and confirmatory as the confirmatory approach, although grounded in theory, similarly involves the testing of models and the application of a data-driven approach to understanding the concept under investigation (Hurley et al., 1997). This method of factor analysis has also been shown to require substantive sample sizes in order to accurately identify or determine factors (MacCallum, Widaman, Zhang, & Hong, 1999).

CFA is commonly applied to understand constructs within social sciences and Psychology testing theory and hypotheses and is used widely in the development and understanding of psychometrics (T. A. Brown, 2015). The use of CFA can determine how items are linked and can determine the organisation of items into subscales or latent diagnostic concepts. CFA is typically used in the later stages of scale development to ensure the validity of a scales items/construct measures and to provide evidence for the theoretical approach laid out by researchers (Hurley et al., 1997). Indeed, the application of such pretesting with psychometric scale is considered good practice in measure development (T. A. Brown, 2015). This statistical technique has been applied frequently in the study of PTSD and has been used to understand the dimensionality of symptoms in the DSM system (C. C. Armour et al., 2016; Galatzer-Levy & Bryant, 2013; Rasmussen, Verkuilen, Jayawickreme, Wu, & McCluskey, 2019).

There is a contested body of literature concerning the sample size requirement in order to effectively apply CFA. Indeed, within the literature there are recommendations related to the number of indicators per factor [i.e. a ratio of 1:5, 1:10 etc.] as well as absolute numbers that may be used to achieve statistical power

(Bentler & Chou, 1987; Mundfrom, Shaw, & Ke, 2005). The proposed *N* for the testing of various statistical models varies widely, for example evidence presented from Monte Carlo simulations, a mathematical system of generated data sets using random sampling used to test statistical inferences and models (Rubinstein & Kroese, 2016) shows that required sample sizes to test the same proposed latent model may range between 120 and 460 depending on factor loadings (Wolf, Harrington, Clark, & Miller, 2013). Myers, Ahn, and Jin (2011) similarly utilised a Monte Carlo approach to model and test the potential of absolute values for sample size to achieve power in validation studies. This study concluded that an *N* of 200 or greater was sufficient to test a theoretical model and 300 or greater to test a population model; i.e. one derived of population observation or sampling, of latent psychological constructs (N. D. Myers et al., 2011).

There are a number of factors on which the necessary sample size is contingent, such as factor loadings as previously discussed, number of variables and indicators, number of proposed factors and the structure of these [i.e. subordinate and super ordinate factors] (see Wolf et al., 2013). Further to this, Myers et al. (2011) noted that evidence derived from previous research and Monte Carlo simulations should only be considered indicative as populations and models vary greatly between studies and these may impact the bases of sample size requirements. It is therefore recommended that factor validation be conducted with data collected from the study population of interest.

There are a number of proposed factor structures to C-PTSD. For instance, Karatzias et al. (2016) specified and tested seven theoretically driven models of C-PTSD consistent with the then proposed specifications for the ICD-11 (WHO, 2019) and with previous validation of the ITQ (Karatzias et al., 2016). CFA is outlined above as an appropriate approach to test the hypothesised theoretical structures of a diagnostic concept, and is therefore applied in this study using the International Trauma Questionnaire (ITQ) among the NI military veteran population (Hurley et al., 1997). To date there exists much support for the factorial validity of C-PTSD but contention over the definitive factor structure (Hyland, Shevlin, Brewin, et al., 2017).

The following section outlines these proposed models and critically discusses evidence in support of them.

3.1.2 Factor Models of C-PTSD

Previous studies investigating ICD-11 PTSD and C-PTSD have supported somewhat competing latent variable models of these disorders. Among those supported are first-order models ranging from univariate (one factor) to six factors, as well as second-order latent models encompassing six first-order factors and one or two second-order factors (Hyland, Shevlin, Brewin, et al., 2017). Evidence in support of factorial models in order of complexity is hence presented and discussed in this sub-section in order of model complexity ranging from a univariate model of C-PTSD to higher-order factorial models;

Many authors have proposed and tested the viability of simple and parsimonious models of C-PTSD in comparison to more intricate factorial models (Hyland, Shevlin, Brewin, et al., 2017). These restricted factor models find relatively little support, often discarded in favour of more statistically and theoretically sophisticated factor models. Silove, Tay, Kareth, & Rees (2017) offered support for the most parsimonious models considered; both a *single-factor*, and *two-factor model* among West Papuan refugees. These results showed that a general single factor of '*Traumatic Stress*' provided the best fit for the data where three indicators of PTSD and three of DSO converged. The authors note there was also support for a two-factor model comprised of PTSD and proposed DSO symptoms respectively, however owing to more parsimonious interpretation the univariate Traumatic Stress factor model was concluded to provide the best fit. This study is however limited by use of proxy measurement of DSO experiences. While authors approximated symptoms in accordance with ICD-11 proposal available at the time (Silove et al., 2017), this analysis also incorporated concepts of complex grief and Major Depression which may have confounded measurement. Further to this, this study utilised a displaced refugee sample (Silove et al., 2017). It may be argued that general or nebulous

traumatic stress factor may best fit this group while this may not extend to other populations.

As part of a Factor Mixture Model (FMM) of C-PTSD investigated among US military veterans, Wolf et al. (2015) supported the applications of a *two-factor model* of C-PTSD over a univariate model where three symptom indicators loaded onto a latent PTSD factor, and three additional indicators loaded onto a latent DSO factor. This factorial model was then used as part of further analyses to example latent patterns of symptom endorsement in the study sample using latent class analysis (Wolf et al., 2015). It should however be noted that the authors of this study exclusively considered a single, and two-factor model of C-PTSD neglecting to further examine more elaborate factor structures. It is hence argued that these results may not have identified the most representative factor structure of C-PTSD. There are therefore grounds for consideration of additional, more elaborate proposals of C-PTSD factor structure.

Cloitre et al. (2013) offered a more expanded formulation of C-PTSD factor structure in a CFA with a treatment-seeking sample from the US exposed to a range of traumatic experiences. The results of this investigation supported the application of a *four-factor model* of C-PTSD. This latent model consisted of a unified PTSD factor correlated with each DSO symptom cluster (*AD*, *NSC*, & *DR*) as a unique factor. It was noted that the DSO factors were strongly correlated with one-and-other ($r > .80$) and although correlation was less strong with core PTSD this remained at least moderate for each factor, $r > .4$ (Cloitre et al., 2013). The results of this study support the diagnostic validity of the proposed symptom clusters of C-PTSD and also their organisation in association chiefly with one and other, and to PTSD symptomology.

A similar four-factor correlational model comprised of the same latent factors was supported in a sample of child-abuse survivors (Knefel & Lueger-Schuster, 2013). These results similarly lent greater confidence to the then proposed factor structure of C-PTSD; of PTSD core symptoms and the three related DSO domains (Knefel & Lueger-Schuster, 2013; Maercker, Brewin, Bryant, Cloitre, Reed, et al., 2013). Both

these investigations adopted a CFA approach examining a hypothesised four-factor model consistent with then contemporary evidence and theory (Cloitre et al., 2013; Knefel & Lueger-Schuster, 2013). While both consistently found support for this proposed factorial structure subsequent studies have further examined the viability for delineation of the PTSD factor, as well as the introduction of higher order factors to explain the high degree of correlation and significance of correlation between DSO factors noted in these studies.

With respect to delineation of the PTSD factor; Böttche et al. (2018) conducted a study of a German trauma-exposed community and treatment-seeking sample finding support for a *six-factor model* where each symptom concept was distinguished as a unique latent factor. Hence C-PTSD is argued to be best represented by three PTSD factors (*Re*, *Av*, & *Th*) and three DSO factors (*AD*, *NSC*, & *DR*). The authors conclude that these results supported the current criteria of C-PTSD as proposed by the ICD-11, validating the concept of each symptom. This investigation notably examined the validity of a one, two, four and six-factor model to fit the data and ultimately supported a six-factor solution. In addition to this, Tay, Rees, Chen, Kareth, and Silove (2015) likewise supported the application of a six-factor solution of C-PTSD structure reminiscent of that described above, however only tested this model and a univariate higher-order model. Indeed, in a replication and extension study conducted in the sample population the authors found this six-factor structure to marginally outperform more elaborate models involving one and two higher order factors (Tay et al., 2018). The conclusions of these investigations are however limited once again by the application of proxy measurement of C-PTSD symptoms (Hyland, Shevlin, Brewin, et al., 2017).

Contrary to the above mentioned findings, research in a variety of clinical and community populations have found support for six-factor models of C-PTSD, however more intricate models involving *second-order factors* have been found to fit data more favourably (Hyland, Shevlin, Elklit, et al., 2017; Karatzias et al., 2016). These findings have ultimately supported the adoption of these hierarchical models.

Evidence and arguments for these second-order models of C-PTSD are hence presented below.

A second or higher order construct is a latent variable characterised by latent sub-constructs within a factor model, i.e. the first-order latent factors are part of one or more superordinate latent factors (Awang, 2012). The first-order factors may be found to be co-related in analysis and hence application of a superordinate second-order factor may help distinguish the multidimensional nature of observations (Kenny, 2016). Researchers have investigated the application of models comprised of the previously supported six-factor solution in addition to higher-order factors explaining the covariance between latent factors.

With respect to this, there has been limited support found for a *univariate higher-order model* of C-PTSD (Silove et al., 2017). It should also be noted that Tay, Rees, Chen, Kareth, and Silove (2015) examined the utility of a univariate higher order model and failed to support this. The authors argued this to be evidence cautioning the conceptualisation of C-PTSD as a unique diagnostic concept. Subsequent investigation replicated these findings prompting the authors to consider support for C-PTSD in essence if not for the ICD-11 taxonomic concept (Tay et al., 2018). The efficacy of a univariate higher-order factor under which the six latent factors described above has been investigated by other researchers finding little support for this hypothesised structure (Nickerson et al., 2016). While this model has been found to exhibit acceptable fit indices models comprised of two higher-order factors onto which PTSD and DSO factors are loaded respectively have been found to perform superiorly in terms of model fit and interpretation (Hyland, Shevlin, Brewin, et al., 2017; Karatzias et al., 2016).

A *six-factor higher-order model* of C-PTSD comprised of the aforementioned six factors and two higher-order factors indicative of PTSD and DSO has therefore been more widely supported across numerous studies (Hyland, Murphy, et al., 2017; Karatzias et al., 2016; Kazlauskas et al., 2018; Vallières et al., 2018).

Karatzias et al. (2016) conducted an extensive validation of a development version of the ITQ [ICD-TQ V1.2] among a trauma-exposed treatment seeking population in the UK. This study evaluated several potential latent factor models ranging from a single-factor model to more elaborate organisations of factors in first and second-order positions. These data were supportive of both a six-factor first order model whereby each PTSD and DSO symptom were correlated, and of a two-factor higher-order model defined by superordinate PTSD and DSO factors measured by three first-order factors [symptoms] each (Karatzias et al., 2016). The two-factor second order model was supported by the authors owing to the acceptable model fit indices, consistency of this structure with the theoretical background to C-PTSD, and the promotion of greater parsimony (Karatzias et al., 2016). It should additionally be noted that this finding and interpretation was replicated by another study evaluating the same proposed factor structures in a separate trauma-exposed UK sample (Hyland, Shevlin, Brewin, et al., 2017).

Hyland, Shevlin, Elklit, et al. (2017) evaluated a similar series of potential factor models of C-PTSD among Danish adult survivors of childhood sexual abuse. The findings of this study showed support once again for both a six-factor first-order model and a two-factor higher-order model. The authors of this investigation likewise endorsed the application of the more elaborate second-order model of C-PTSD owing to the production of acceptable fit indices and theoretical consistency (Hyland, Shevlin, Elklit, et al., 2017). The results of these studies together consistently suggest that both six-factor and two-factor higher order models are viable conceptualisations of C-PTSD (Hyland, Shevlin, Brewin, et al., 2017; Karatzias et al., 2016). Both support the distinction of PTSD and DSO symptoms and thus the final conceptual validation of the ITQ and adoption of the ICD-11 C-PTSD concept (Cloitre et al., 2018).

These findings may be compared to the aforementioned four-factor model supported by Cloitre et al. (2013). It was acknowledged that the three DSO factors specified were highly correlated in the four-factor model. With the introduction of second-order factors this correlation may be explained by another latent factor, i.e. a DSO latent construct. Karatzias et al. (2016) note that the data driven approach to organisation of factors by first and second-order structures in certainly evidenced however is not

a necessity. It may be argued that this organisation of latent factors informs better the organisation of concepts associated with C-PTSD and benefits theoretical consistency and development.

It should be noted that the above-mentioned second-order factorial model of C-PTSD is not unanimously supported. In an extension and replication to an earlier cited study in support of a six-factor solution to C-PTSD (Tay, Rees, Chen, Kareth, & Silove, 2015), Tay et al. (2018) examined the viability of the two-factor higher order model of C-PTSD which was found to be unsupported and once again the non-hierarchical six factor model was found to be marginally superior. It should be acknowledged that this study evaluated DSO symptoms using the Refugee Mental Health Assessment package (Tay, Rees, Chen, Kareth, Mohsin, et al., 2015), which may limit comparisons to other studies using the ITQ. These results were once again supported in a sample of displaced West Papuan refugees and are limited in terms of generalisation through this sampling. It should be concluded that there is support found for the concept of C-PTSD in a six-factor correlated model and hierarchical two-factor second-order model and it is prudent to consider the applicability of both models (Hyland, Shevlin, Elklit, et al., 2017).

It is important to adopt such an approach to examining the different facets of C-PTSD in order to best understand the distinct facets of this disorder in comparison to PTSD symptomology. It should also be noted that in a recently published investigation of C-PTSD factorial structure among Filipino combat veterans likewise found that the six-factor model was supported above all others examined, including higher-order models (Mordeno et al., 2019). The authors argue that this finding undermines the assertion of sibling diagnostic categories and rather highlights the efficacy of a dimensional approach to understanding C-PTSD (Mordeno et al., 2019). That is; symptomology should be regarded as a collection of independent clusters (factors) rather than adhering to PTSD and DSO status.

The two-factor second-order factor model has however been supported by authors using alternative measures of C-PTSD symptoms. Nickerson et al. (2016) similarly supported a two-factor higher order model to provide the best fit among a traumatised and treatment-seeking refugee sample. This model equally found PTSD and DSO factors to be distinct but co-related and comprised of the same three second-order factors (Nickerson et al., 2016). Measurement of PTSD and DSO symptoms in this study were obtained using items adapted from a mixture of existing scales and measures. Participant responses to question items conceptually related to each DSO experience were evaluated and caseness was similarly defined as endorsement of at least one experience of each DSO symptom. Furthermore, Litvin, Kaminski, and Riggs (2017) in a validation study of an alternative measure of C-PTSD symptomology, the Complex Trauma Inventory, found an equitable latent model of C-PTSD pathology comprised of PTSD and DSO second order factors each formed by three respective symptom clusters. Taken together these results offer support for the external reliability and validity of C-PTSD as the same symptom structure is captured by alternative measures.

Despite relatively minor disparity results, findings are relatively consistent in supporting the validity of PTSD and C-PTSD as proposed by the ICD-11 (Shevlin et al., 2018). There is however a lack of empirical research concerning the validity and latent structure of C-PTSD among military veterans, with the studies by Wolf et al. (2015) and Mordeno et al. (2019) marking the only utilising this population. It is a stated goal to have the ICD criteria for PTSD be confirmed and evaluated across populations and contexts (Karatzias, Cloitre, et al., 2017). Hence the current investigation seeks to address this gap by investigating the latent factors of this condition in a novel population of military veterans.

Due to the relatively emerging nature of this area of research much of the extant literature on these concepts stems from use of proxy measures. It is therefore argued that inconsistent concept and measurement of symptoms to date necessitates further study using a unified concept and standardised measure of [C-]PTSD (S. Murphy, Elklit, et al., 2018). Indeed, Nickerson et al. (2016) posits that greater

evidence applying a standardised measure of C-PTSD lends greater confidence to conclusions, citing specifically the *International Trauma Questionnaire*. Opportunity to address this gap in the literature comes from the recent development and validation of measurement of ICD-11 PTSD and C-PTSD in the ITQ (Cloitre et al., 2018).

3.1.3 The International Trauma Questionnaire

The ITQ (Cloitre et al., 2018) is a 18-item measure of PTSD [6B40] and Complex PTSD [6B41] symptoms as codified by the ICD-11 (WHO, 2019a; WHO, 2019b). This inventory is said to represent the goals of the WHO and acts and an effective tool for research and clinical use (Cloitre et al., 2018). The ITQ has been psychometrically validated for use as a research tool among clinical and community populations (Cloitre et al., 2018; Hyland, Shevlin, Brewin, et al., 2017). The ITQ is developed in close accordance with the proposed guidelines outlined by the ICD-11 working group and as such represents the closest approximation of the diagnostic concept (Shevlin et al., 2018).

The validation of this measure and the symptom structures of C-PTSD has been informed by the factor analytic studies of development versions of this measure previously discussed (Hyland, Shevlin, Brewin, et al., 2017; Karatzias et al., 2016). Owing to consistency in findings across multiple studies (see Cloitre et al., 2018; Hyland, Shevlin, Brewin, et al., 2017; Karatzias et al., 2016; Nickerson et al., 2016), the *six first-order factor*, *two factor higher-order model* has been implemented as the agreed conceptual model of ICD-11 C-PTSD. Despite large agreement there remains an effort to extend and validate the use of this measure as part of global standardisation across various contexts (Karatzias, Cloitre, et al., 2017).

3.1.4 Research Aims

The goal of this study is to assess the viability of previously proposed factor models of C-PTSD to conceptualise the disorder in the NI veteran population. Moreover, this study seeks to confirm the validity of the agreed factor structure of the ITQ thus supporting its use in the study population. Use of the validated and finalised ITQ is

considered to be of merit in the current study addressing a limitation of many prior factor analytic studies using proxy measurement and development versions of the ICD-TQ (Hyland, Shevlin, Brewin, et al., 2017). This approximation of symptom endorsement in prior studies using measures not constructed to relate specifically to ICD-11 post-traumatic symptoms and distress is argued to limit the external validity of results (de Jongh et al., 2017).

This investigation hence utilises a CFA approach to test a series of proposed and evidenced first and second-order factor models of C-PTSD to further validate the factor structure of the ITQ and its use with the NI veteran population.

3.2 Methodology

3.2.1 Measures

Sociodemographic information was collected using a bespoke inventory of items examining gender, age, and military service characteristics along with other general demographic items.

Post-Traumatic Stress Disorder and *Complex Post-Traumatic Stress Disorder* was assessed using the International Trauma Questionnaire (ITQ; Cloitre et al., 2018). Although a 24-item development version of this measure (V1.5.2; Cloitre, Roberts, Bisson, & Brewin, 2015) was administered to participants, the current study analysed the 18-item validated and published version of this measure (Cloitre et al., 2018) as this contributes more directly to the wider literature. The items included in both versions of this measure are described by Karatzias et al. (2016) and Cloitre et al. (2018). These are also detailed in *Appendix 2.1.*

The final version of the ITQ analysed in this study consisted of six items measuring symptoms of PTSD; two Re-experiencing, two Avoidance, and two Sense of Threat, and six items measuring DSO symptoms; two Affect Dysregulation, two Negative Self-Concept, and two Disturbances in Relationships (Cloitre et al., 2018). All items enquire about the extent to which the respondent has been bothered by symptoms in the previous month for PTSD items, and in general for DSO item. In addition to these, the ITQ includes six items measuring the degree of symptom-related functional impairment experienced in the previous month. Responses to all items are on a five-point Likert scale from 0 '*Not at All*' to 4 '*Extremely*'.

The ITQ was found to have a favourable index of reliability in the current sample on each subscale; Re-experiencing (α = .936), Avoidance (α = .942), Sense of Threat (α = .907), Affect Dysregulation (α = .879), Negative Self-Concept (α = .973), and Disturbances in Relationships (α = .901). The high value of alpha observed within these subscales should be acknowledged to potentially indicate a high degree of correlation between items.

3.2.2 Procedure

For a thorough description of data collection and preparation procedures please consult *Chapter 2; Main Survey Phase* and *Dataset Administration.*

Data were collected over a continuous 12-month period from December 2017 to December 2018 using Qualtrics online survey software. During this time the research team engaged in several recruitment promotion activities across serval settings while there remained an open invitation for eligible participants to complete the survey online. Due to this an effective response rate could not be calculated for this survey.

Preliminary analyses were conducted, and cases were examined for missingness. From the initial sample (N = 903), a total of n = 319 responses were excluded due to redirection based on failure to provide consent. Of those excluded, n = 227 responses were excluded due to excessive amounts of partial missing data (>20%) on study variables. This dataset was assessed using Little's MCAR test which supported the data were missing completely at random; $\chi 2(130, n = 584) = 151.016$, p = .10. The variables of interest in this study were found to be non-normally distributed, therefore the Mann-Whitney U test was used to compare groups. The results of these analyses may be found in Appendix 3.0. The sum of these showed the mean response of those included in analyses did not differ significantly from those excluded on any key study variables. This dataset was assessed using Little's MCAR test which supported the data were missing completely at random; $\chi 2(130, n = 533) = 151.016$, $p = .100$. This procedure yielded a final sample for use in this study of N = 357.

Assumptions were hence met to apply an *Expectation Maximization* (EM) method to estimate missing values. EM is a robust method of value replacement using available information where data meet the assumption of being missing at random (Enders, 2003). EM iteratively estimates values for those missing based on available parameters, and then again with the complete data with the newly imputed values (Schlomer, Bauman, & Card, 2010). In circumstances where the missing data are missing completely at random and estimation of data is low the potential for bias is

argued to be negligible (Graham, 2009). Graham (2009) further notes that low amounts of missing data and fewer study variables is preferable when using EM due to the large number of calculations, and hence time, required. This procedure was conducted using the *Missing Data Analysis* feature in IBM SPSS to generate a complete dataset for primary analyses.

3.2.3 Participants

Table 3.1 details the demographics of the final dataset used in analysis. Participant ages ranged from 18 to 86 (*M* = 54.79, *SD* = 11.350). The sample was predominately male, married, and had previously served in the Army.

Table 3.1; Chapter Three Participant Demographic Information

Variable	***n* (%)**
Gender	
Male	319 (89.4)
Female	38 (10.6)
Relationship Status	
Single	21 (5.9)
Married	262 (73.4)
Separated or Divorced	60 (16.8)
Widowed	13 (3.6)
Engaged	1 (0.3)
Employment Status	
Unemployed	21 (5.9)
Self Employed	26 (7.3)
Employed (Full-time)	148 (41.5)
Employed (Part-time)	24 (6.7)
Student	8 (2.2)
Unable to work	42 (11.8)
Retired	78 (21.8)
Medically Retired	42 (11.8)
Other/Unspecified	11 (3.1)
Branch	
Royal Navy	32 (9)
Royal Marines	8 (2.2)
Army	313 (87.7)
Royal Air Force	24 (6.7)
Rank	
Officer	78 (21.8)
Non-Commissioned Officer	189 (52.9)
Other rank	90 (25.2)

Time in service (Regular)	
N/A - Never	30 (8.4)
0-10 years	125 (43.4)
11-20 years	104 (29.1)
21-30 years	95 (26.6)
Refused	3 (0.8)
Time in service (Reserve)	
N/A - Never	153 (42.9)
0-10 years	135 (37.8)
11-20 years	27 (7.6)
Refused	24 (6.7)
Current reservist	
Yes	34 (9.5)
No	323 (90.5)
Service in Northern Ireland (UDR or Royal Irish)	
Yes	176 (49.3)
No	180 (50.4)
Refused	1 (0.3)

3.2.4 Data Analytic Plan

As discussed, a number of viable latent factor structures have been posited with a variety of latent factor models of C-PTSD supported in the literature (see Hyland, Shevlin, Elklit, et al., 2017; Shevlin, Hyland, Roberts, et al., 2018). There currently exist a number of theoretical and empirical writings concerning C-PTSD consistent in contributing to the largely standardised concept (Cloitre et al., 2018; Maercker, Brewin, Bryant, Cloitre, Reed, et al., 2013). However, there remains variability in findings related to the factor structure of this disorder. While there is no definite consensus in such contexts it is often considered appropriate to adopt a hypothesis testing approach to understand latent factors (Hurley et al., 1997). This study hence utilised CFA to empirically test the extent to which previously supported latent models best represent these data in the current study population.

In line with these validation studies and in accordance with best practices in CFA research this study tested a series of iterative latent models in line with the findings of previous research and extant theory (Hyland, Shevlin, Elklit, et al., 2017; Mueller & Hancock, 2008; Ropovik, 2015). These factor analytic models are represented by

Figures 3.1 to *3.6* overleaf. The current investigation sought to test these for theoretical consistency and potential model fit for these data using the ITQ.

Inspection of trimmed means and distributions within the dataset suggested it to be free of outliers or 'extreme cases'. The primary study variables within this investigation were however found previously to be non-normally distributed. While this has the potential to introduce bias in factor model estimation, the use of the Robust Maximum Likelihood (MLR) estimator has been found to generate reliable fit indices and model estimation using non-normal data (Suh, 2015). All factor models were estimated using Mplus 7.3.1 (Muthen & Muthen, 2015) using the MLR estimator.

Figure 3.1; Model 1 - Unidimensional Latent Model of C-PTSD

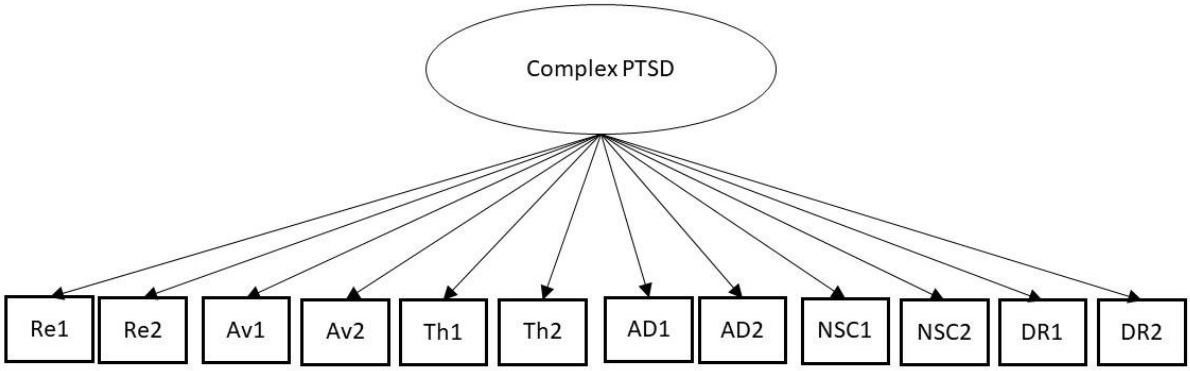


Figure 3.2; Model 2 – Two-Factor, First Order Latent Model of C-PTSD

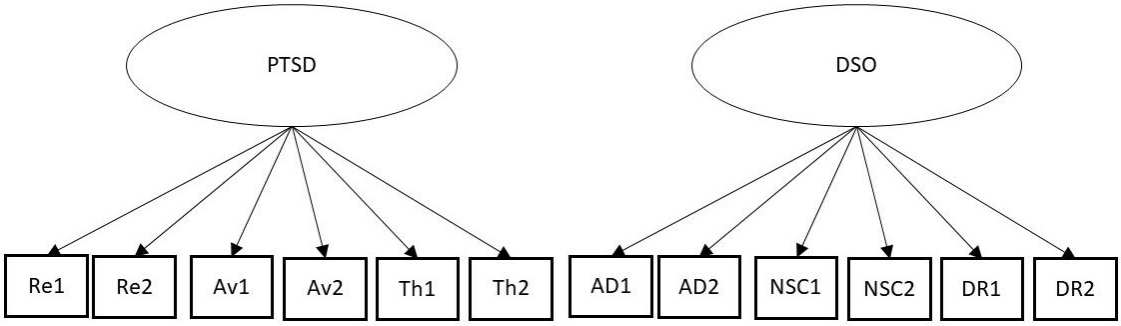


Figure 3.3; Model 3 – Four-Factor Correlational Model of C-PTSD

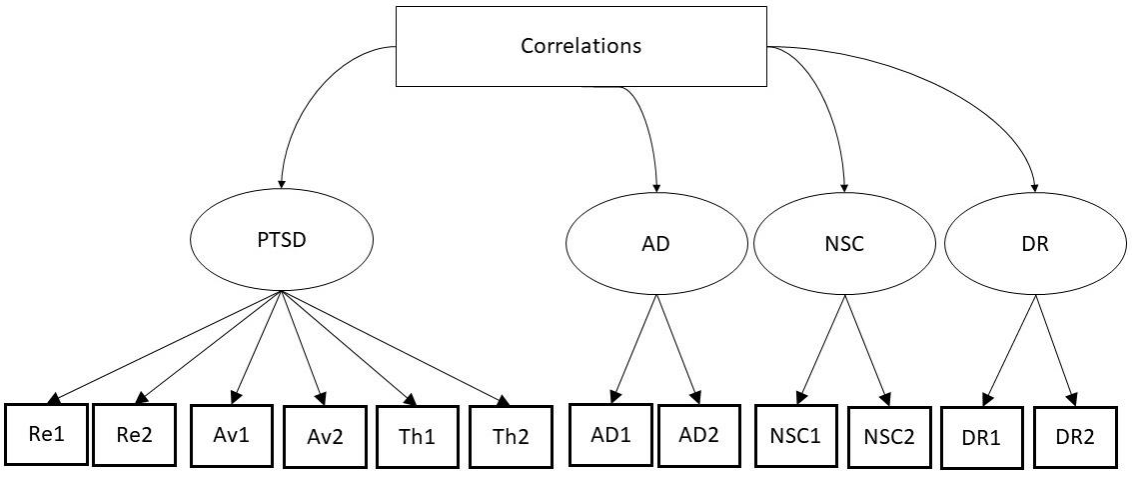


Figure 3.4; Model 4 – Six-Factor, First-Order Latent Model of C-PTSD

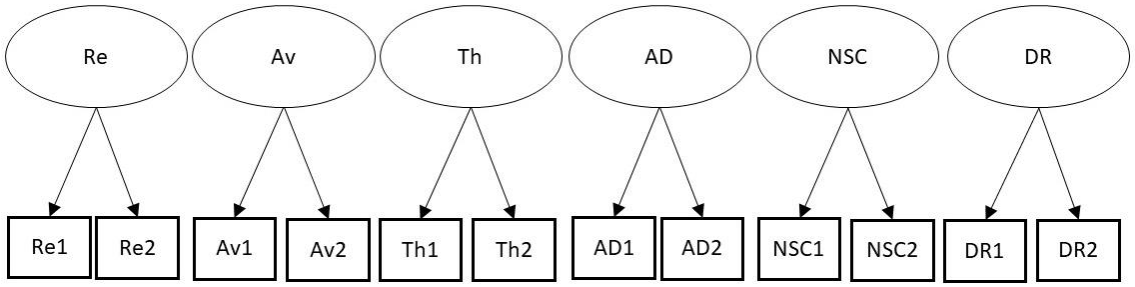


Figure 3.5; Model 5 – Single-Factor, Second-Order Latent Model of C-PTSD

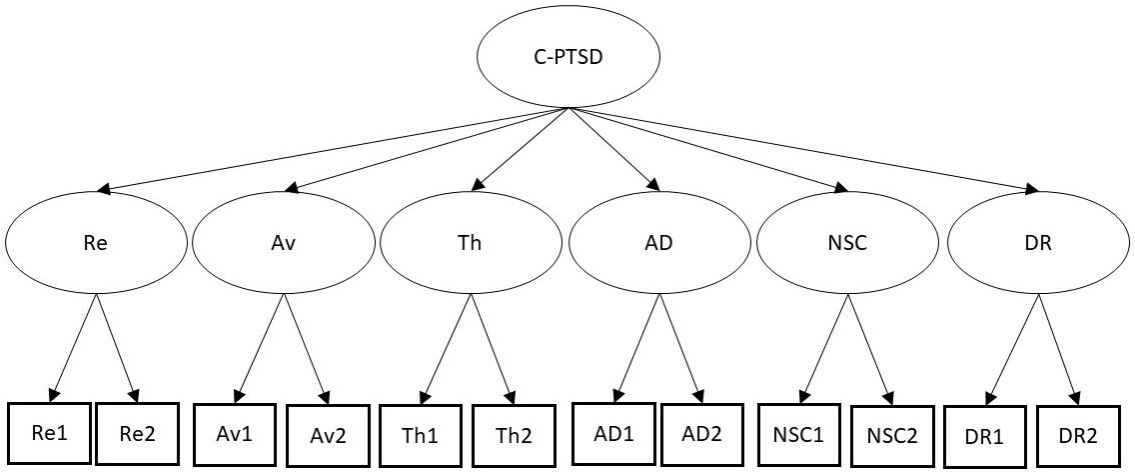
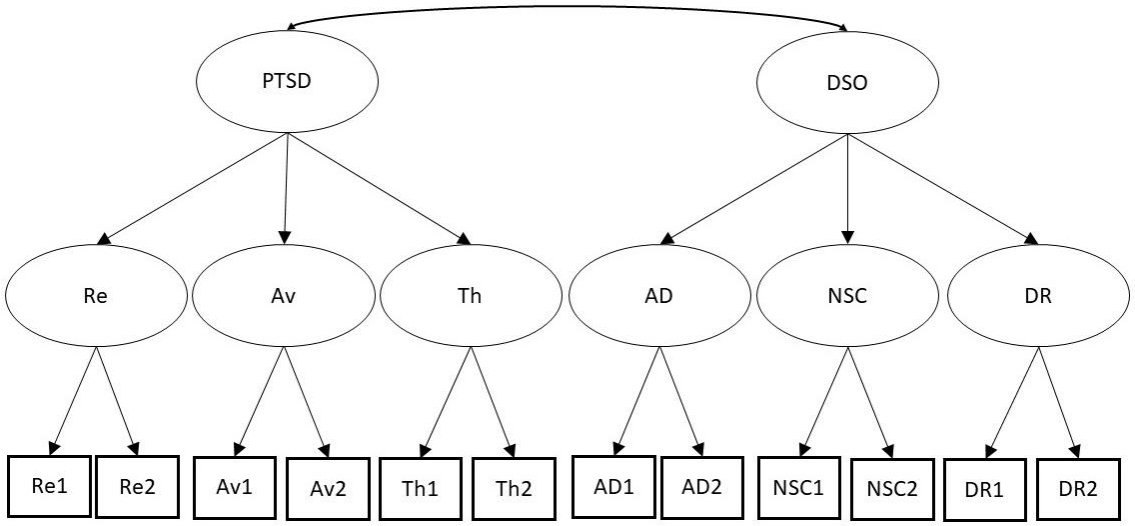


Figure 3.6; Model 6 – Two-Factor, Second-Order (Six First-Order Factors) Latent Model of C-PTSD



** Re = Re-experiencing, Av = Avoidance, Th = Sense of Threat, AD = Affect Dysregulation, NSC = Negative Self Concept, DR = Disturbance in Relationships, DSO = Disturbances in Self-Organisation Squared boxes represent indicator variables, Oval items are representative of latent variables.*

3.3 Results

3.3.1 Interpretation of Fit Indices

The *Chi Square* statistic is a measure of goodness of model fit that details to what degree the specified model fits the data and if this is statistically significant. This statistic is commonly reported in CFA studies where multiple models are tested to allow for identification of superior models (Schreiber, Nora, Stage, Barlow, & King, 2006). Schreiber et al. (2006) further note however that this alone does not provide sufficient information for model selection and hence other information criteria should be used. There are a number of fit indices calculated as functions of the chi square statistic that may hence be used to supplement analysis (Xia & Yang, 2018). A statistically significant result should not mean a model is rejected as relative sample size affects this statistic causing otherwise reasonable models to be rejected erroneously (Tanaka, 1987; van de Schoot, Lugtig, & Hox, 2012).

The *Comparative Fit Index* (CFI) and *Tucker Lewis Index* (TLI) may be used to allow for comparative analysis of model fit. Both statistics range from 0 to 1 representing to what degree the model specified may be said to fit the data with values closer to 1 representative of better model fit (Schermelleh-Engel, Moosbrugger, & Müller, 2003). A value greater than or equal to .95 is considered to be indicative of 'acceptable' model fit (Schermelleh-Engel et al., 2003; Schreiber et al., 2006).

The *Root Mean Square Error of Approximation* (RMSEA) is a sample size sensitive estimate of model fit bound to 0, where lower values indicate a more 'perfectly fitted' model (Schermelleh-Engel et al., 2003). Values less than .05 are considered to be indicative of 'good' model fit (Schermelleh-Engel et al., 2003) and .06 to .08 to indicate 'acceptable' fit (Schreiber et al., 2006). Furthermore, it is considered good practice to consider and report confidence intervals for the RMSEA (Schreiber et al., 2006).

The *Standardised Root Mean Square Residual* (SRMR) is an absolute fit statistic independent of sample size (Cangur & Ercan, 2015). A generated value of .08 or lower is recommended to indicate good model fit, and .05 or lower to indicate closer [more

favourable] model fit, in combination with other favourable fit indices (R. B. Kline, 2015).

The *Bayesian Information Criterion* (BIC) is used for model comparison and selection among specified models of the same data. This statistic is argued to be appropriate to determine the 'most true' model of those assessed, with lower resultant values indicative of more true fit to the data (Burnham & Anderson, 2003). In model comparison, a value reduction in excess of 10 is considered to very strongly indicate a significant improvement in model fit (Raftery, 1995).

3.3.2 Model Selection and Evaluation

Model fit statistics for *Models 1* to *6* are presented in *Table 3.2* overleaf. *Models 4* and *6 produced* the most favourable fit indices meeting criteria for 'acceptable' fit as previously discussed. The CFI and TLI values for these models were above .95 indicating excellent model fit for the data. Interpretation of the RMSEA supports a conclusion of 'excellent' or 'acceptable' fit for both models (Schreiber et al., 2006). It was noted that while *Model 5* produced favourable CFI and TLI values, however the RMSEA fell outside the determined cut-off for acceptable fit and the SRMR was less favourable than *Models 4* and *6*. While these models were found to provide adequate fit for the data inspection of the BIC showed that the *Model 6* produced a lower statistic ($\Delta BIC > 10$) indicating a significantly superior fit to *Model 4* (Ben-Ezra et al., 2018; Hyland, Shevlin, Elklit, et al., 2017). It should however be noted that the support of *Model 6* is caveated by the simultaneous acceptability of *Model 4* as shown by the majority of fit indices.

Table 3.2; Model Fit Indices for Proposed Factor Models of C-PTSD

Model	χ2 (p)	*df*	CFI	TLI	RMSEA (90% CI)	SRMR	BIC
1	1028.550 (.000)	54	.812	.787	.225 (.213 - .237)	.048	11295.482
2	785.744 (.000)	53	.861	.826	.197 (.185 - .209)	.040	11058.555
3	435.314 (.000)	48	.926	.899	.150 (.138 - .163)	.031	10737.513
4	*82.658 (.000)*	*39*	*.992*	*.986*	*.056 (.039 - .073)*	*.015*	*10437.756*
5	173.639 (.000)	48	.976	.967	.086 (.072 - .100)	.028	10475.838
6	***118.095 (.000)***	***47***	***.986***	***.981***	***.065 (.051 - .080)***	***.020***	***10426.171***

Note: χ2 = Chi Square, *df = degrees of freedom, p = statistical significance, CFI = Comparative Fit Index, TLI = Tucker Lewis Index, RMESA = Root Mean Square Error of Approximation, SRMR = Standardised Root Mean Square Residual, BIC = Bayesian Information Criterion.*
Supported model shown in bold.

Based on interpretation of the fit indices as discussed in the previous section and parsimonious interpretation in line with theoretical literature, *Model 6* was selected as the best fitting model. Factor loadings for each item/indicator of the ITQ for this model are presented in *Figure 3.7* below.

Figure 3.7; Standardised Item/Factor Loadings for Model 6

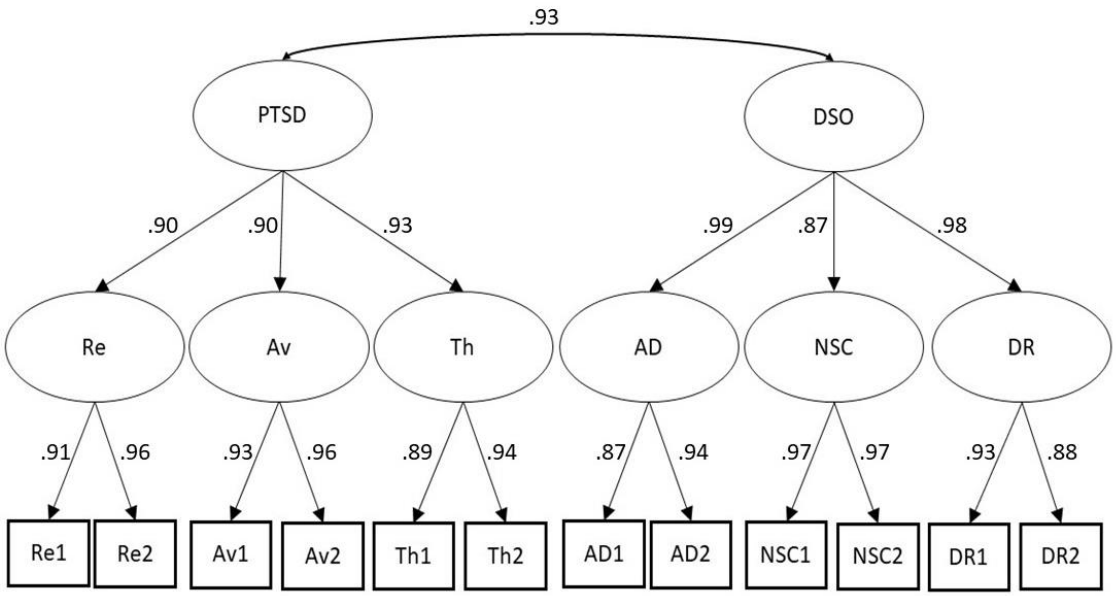


Table 3.3; Standardised Item/Factor Loadings (Standard Errors) for Model 6

	Re	Av	Th	AD	NSC	DR
Item						
1. Upsetting Dreams	91 (.01)					
2. Powerful Images	.96 (.01)					
3. Internal Avoidance		.93 (.01)				
4. External Avoidance		.96 (.01)				
5. Hyperarousal			.89 (.01)			
6. Exaggerated Startle			.94 (.01)			
7. Reactive				.87 (.02)		
8. Emotionally numb				.94 (.01)		
9. Feel like a Failure					.97 (.01)	
10. Feel Worthless					.97 (.01)	
11. Feel distant						.93 (.01)
12. Emotionally close						.88 (.01)
Second-Order Factors						
PTSD	.90 (.02)	.90 (.02)	.93 (.01)			
DSO				.99 (.01)	.87 (.01)	.98 (.01)

Note: Re = Re-experiencing, Av = Avoidance, Th = Sense of Threat, AD = Affect Dysregulation, Hr = Hyperactivation, Ho = Hypoactivation, NSC = Negative Self-Concept, DR = Disturbed Relationships. All factor loading statistically significant (p < .001).

Figure 3.7 and *Table 3.3* above detail factor loading correlations of ITQ items for the supported model. Inspection of these factor loadings concludes that all indicators load excellently onto their respective first-order factors, as do first-order on to second-order factors (all $r > .80$) and were statistically significant ($p < .001$). The PTSD and DSO second order factors were found to be significantly and highly correlated with each other ($r = .93$, $p < .001$). This high degree of correlation may be considered to indicate unidimensionality of the ITQ. It should however be noted that the unidimensional higher order model (*Model 5*) provided a poorer fit to the data. It is therefore concluded that the separation of these higher order factors (*Model 6*) is upported by the data, but the high inter-factor correlation should be acknowledged.

3.4 Discussion

The current study aimed to asses an omnibus of factor models of C-PTSD based on prior evidence across heterogeneous samples and populations. Findings were supportive of a number previous results obtained from community and clinical samples supporting a factor structure characterised by *Re-experiencing*, *Avoidance*, *Sense of Threat*, *Affect Dysregulation*, *Negative Self-Concept*, and *Disturbed Relationships* and two second-order factors labelled *PTSD* and *DSO* (see Cloitre et al., 2018; Hyland, Shevlin, Brewin, et al., 2017). The same factor structure supported herein informed the item selection and diagnostic structure of the ITQ (Cloitre et al., 2018; Shevlin et al., 2018), and hence the consistency in findings in the current study further validate the use of the ITQ to assess PTSD and C-PTSD in the study population.

The more elaborate higher-order model was selected in the current investigation over the six-factor correlated model citing acceptable fit indices and interpretability however both models were found to provide acceptable fit. This decision is mirrored in previous investigations of C-PTSD factorial validity to similarly find these models to both provide acceptable fit (Hyland, Shevlin, Brewin, et al., 2017; Karatzias et al., 2016). The presence of correlated second-order PTSD and DSO factors in the endorsed model tentatively support the ICD-11 assertion that PTSD and C-PTSD are distinct, but related, sibling disorders (Hyland, Shevlin, Elklit, et al., 2017). However, this conclusion is caveated by noting the simultaneous acceptability of the six-factor correlated model. Emerging evidence suggests that the second-order model is more frequently supported in clinical and highly traumatised populations while the correlated six-factor model is preferred in community samples (Ho et al., 2019). Future investigations should therefore not disregard the potential utility of both models in different populations and continue to consider both viable and theoretically consistent.

It is highlighted that the results of this study are comparable to that of Mordeno et al. (2019) similarly investigating C-PTSD facture structure among military veterans. The conclusions however differ in that the current study endorsed a two-factor higher order model where Mordeno et al. (2019) concluded the six-factor model provided the best fit owing to more favourable fit indices. Mordeno et al. (2019)

however did not employ analysis of BIC indices which prompted the difference in conclusions of the current study. Nevertheless, the common support in results of both studies assert that the six-factor and two-factor higher-order models are considered appropriate factorial structures in NI and Filipino military veteran populations.

Consistent with expectations the 12 symptom items of the ITQ loaded excellently on to six first-order factors representative of PTSD and DSO symptoms. The current study found the ICD-11 specified model and structure to provide a good fit for the data confirming construct validity in a population of NI military veterans. These results compliment that of previous researchers in confirming the psychometric properties and internal validity of the ITQ in a variety of samples (Karatzias, Cloitre, et al., 2017; Kazlauskas et al., 2018; Knefel, Karatzias, et al., 2019). This confirmation of the proposed factor structure and indicators used lends additional support to the application of ICD-11 proposals for C-PTSD and the use of the ITQ across populations (Shevlin et al., 2018).

Understanding of these factors; their relevance, relation to each other, and interaction, is beneficial for clinicians in assessment and formulation of effective treatment strategies. It should however be acknowledged that statistical complexity and substantiating the most elaborate model does not always produce the most clinically useful concept (Rasmussen et al., 2019). The increasing indicators and dimensionality of DSM-5 PTSD has led to criticism of its utility citing over complication (Galatzer-Levy & Bryant, 2013; Rasmussen et al., 2019). The ICD-11 in contrast to this has instead adopted core principles of parsimony and clinical utility (Maercker, Brewin, Bryant, Cloitre, van Ommeren, et al., 2013). The decision of latent model endorsement should therefore be guide by empirical results as well as parsimonious and consistent interpretation.

It should additionally be noted that the two high-order factors within *Model 6* were found to be highly correlated. This potentially suggests a unidimensional construct of C-PTSD may exist not delineated by PTSD and DSO (see Shevlin & Adamson, 2005).

This is contrasted however by the finding that the unidimensional higher-order model (*Model 5*) provided poorer fit to the data relative to *Model 6*. Further research is needed to examine the true factor structure of the ITQ and the most effective and clinically useful administration and scoring strategy of the scale.

These results are considered additive to the wider literature validating the factorial validity of the ITQ guiding empirical decisions regarding the latent structure of C-PTSD. The use of a sample of military veterans in NI provides unique evidence in a novel population, congruent with understanding the relevance of this disorder in this specific context and the goals of universality proposed by the WHO (see Karatzias et al., 2017). These results are however considered formative rather than summative and so should be considered in addition to evidence derived from alternative conceptualisations and methods.

3.4.1 Alternative Models and Methods

A relative strength of this study is the testing of an omnibus of models. This avoids criticisms of testing a limited number of models which is argued to bias conclusions in favour of one of those specified (de Jongh et al., 2017). Despite this, all possible models cannot be considered in this investigation as theory develops and more novel approaches are employed to the validation of C-PTSD.

For instance there is a growing body of work suggesting that the latent factors of AD may be better represented by division into two factors; *hyper-* and *hypo-activation* (Ben-Ezra et al., 2018; Karatzias, Hyland, Ben-Ezra, & Shevlin, 2018; S. Murphy, Elklit, et al., 2018; Shevlin, Hyland, Vallières, et al., 2018). The results of these studies similarly support both seven-factor correlated and two factor higher-order factors of PTSD and DSO, with the division of the Affect Regulation factor to produce seven first-order factors (Ben-Ezra et al., 2018; Karatzias, Hyland, Ben-Ezra, et al., 2018; S. Murphy, Elklit, et al., 2018). These results are likened to the supported model of the current study baring the splitting of the AD factor.

van Dijke, Hopman, and Ford (2018) note affect dysregulation, more specifically under-regulation [*Hyperactivation*], significantly mediated the relationship between childhood traumatic exposure and C-PTSD symptomology. This lack of ability to regulate adverse states was demonstrated to affect C-PTSD, however the results for over-regulation of affect were notably non-significant. Over-regulation or *Hypoactivation* may hence be argued to play a less instrumental role in the development of C-PTSD pathology compared to the *Hyperactivation* domain. Nevertheless, prior validation studies of the ITQ have suggested the utility of including both these domains of affect dysregulation in C-PTSD diagnostic criteria (Shevlin et al., 2018). These results support this assertion, finding statistical support for this factorial domain in these data.

The presence of one item per AD domain in this study disallowed for testing of a seven-factor model. Two or more indicators are advised for sufficient and valid identification of a latent construct (R. B. Kline, 2015). Both AD items were however shown to strongly and significantly load onto a single AD factor suggesting the validity of this unified factor in contrast with the seven-factor model. This finding is consistent with the work of Shevlin et al. (2018) in a confirmatory investigation of the validity of the ITQ items suggesting that one hyper- and hypo-activation item sufficiently defined the AD concept. These findings suggest that the contemporary standardised version of the ITQ is a valid measurement of C-PTSD (Cloitre et al., 2018; Shevlin et al., 2018). Nonetheless, future investigations should consider the potential for delineation of AD to provide a more favourable structure of C-PTSD and test this accordingly.

The results of this study may likewise be extended by application of different methods of analysis. One such method that has returned contrasting results to those found in the current study is FMM. The FMM approach involves the estimation of latent factors as well as latent patterns of response through latent class analysis allowing each stage to influence the other to obtain a robust estimation of true effects (Clark et al., 2013). To date two investigations have applied this method to

the validation of C-PTSD; one among US military veterans (Wolf et al., 2015), and one in a sample of refugees living in the US (Frost, Hyland, et al., 2019).

Wolf et al. (2015) found a two-factor solution to provide the best fit as part of the FMM, one factor characteristic of PTSD symptoms and one representative of DSO. The authors however note that the subsequent approach in the FMM led to support of a latent model conceptualised by low, moderate, and high symptomology across all PTSD and DSO items suggesting a lack of support for C-PTSD as a separate construct (Wolf et al., 2015). It was hence argued that results supported that profiles of symptoms were more likely to be linked by symptom severity rather than clustered domains, i.e. PTSD and DSO.

There are some methodological considerations that should be discussed in relation to these results. Firstly, this analysis was conducted on a clinical population defined by endorsement of DSM-5 criteria and an online recruited sample of veterans. This method of selection of clinical sub-sample may be argued to bias to the results of this study as those meeting inclusion criteria of the DSM-5 do not match entirely the criteria of ICD-11 PTSD (Maercker, Brewin, Bryant, Cloitre, Reed, et al., 2013). It should also be noted that FMM while useful for examining heterogeneity within data have been shown to be significantly influenced by measurement variance (Cole, Bauer, Hussong, & Giordano, 2017). This may explain, in part, the disagreement of the findings of Wolf et al. (2015) and previously cited CFA studies of C-PTSD.

In contrast, Frost et al. (2019) in application of a FMM identified and endorsed a correlated six-factor structure, a model considered acceptable and in line with current ICD-11 recommendations related to C-PTSD (Brewin et al., 2017). This study investigated the factor structure of C-PTSD using archival data of resettled refugees in the US (Frost, Hyland, et al., 2019). This discrepancy in findings may be attributed to the different populations surveyed or to the choice of measurement of indicators. Both these FMM investigations utilised proxy measurement of C-PTSD symptoms due to unavailability of the ITQ in the datasets used.

While beneficial in approach to accurate estimation of latent concepts, FMM being elaborate by nature is criticised for a lack of interpretability and application of results

(Clark et al., 2013). While this method presents a challenge to clinicians and researchers, the application of FMM provide useful additional information in the study of psychological disorders considered alongside other latent variable models. Due to the intricacy of this analysis there is also a danger of incorrect or ill-fitting interpretation (Lubke & Muthén, 2005). As such strong theoretical basis for conceptual understanding is required (Lubke & Muthén, 2005). Due to the sparse evidence derived from FMM the above-mentioned results should be considered as indicative rather that summative of the approach. Further investigations into the latent variable concept of C-PTSD are required to strengthen conclusions.

A final alternative or complimentary method to note is that of *Symptom Network Analysis*. This method involved the mapping and estimation of relationships (edges) between symptoms (nodes) within an interrelated network of indicators to display the structure and 'connectiveness' of a psychopathological disorder (Fried et al., 2018). To date this method has been applied to the study of C-PTSD in samples from Israel and the Ukraine (McElroy et al., 2019), Austria (Knefel, Tran, & Lueger-Schuster, 2016), and a composite samples derived from treatment seeking populations in various nations (Knefel, Karatzias, et al., 2019; Knefel, Lueger-Schuster, Bisson, et al., 2019).

Applying network analysis methods to symptoms of PTSD, C-PTSD and Borderline Personality Disorder (BPD), Knefel et al. (2016) identified a sub-group of individuals reporting a cluster of symptoms largely consistent with the DSO domain associated with C-PTSD. The conclusions of this study largely support the then proposed phenomenology of C-PTSD and is largely differentiated from PTSD and BPD.

Studies comparing network structures consistent with ICD-11 C-PTSD criteria in multiple samples (Knefel, Karatzias, et al., 2019; Knefel, Lueger-Schuster, Bisson, et al., 2019) found this network of symptoms to be reliability replicated across various populations with favourable statistical similarity. A similar overall structure was notably also supported by McElroy et al. (2019). McElroy et al. (2019) further describes the increased connectedness of PTSD and DSO symptoms into clusters,

further supporting the understanding of these constructs resulting from proposed C-PTSD symptoms. Results across network analysis studies support the proposed symptoms of C-PTSD, signifying the reliability and validity of the concept. Notably both McElroy et al. (2019) and Knefel, Lueger-Schuster, et al. (2019) found the two AD items to exhibit low connectivity suggesting the link between them is tentative. This findings reminiscent of those citing the superiority of a seven-factor model of C-PTSD (Karatzias, Hyland, Ben-Ezra, et al., 2018). This further highlights the importance for future research of testing alternative hypotheses and statistical techniques in understanding C-PTSD structure.

The Network Analysis approach is not without criticism, however. Over-generalisation or reductionist interpretation of findings is cautioned as authors may introduce bias in their conclusions based on such a novel analytic technique (Guloksuz, Pries, & van Os, 2017). The results of this study however provide a foundational understanding of C-PTSD from a factor analytic perspective that may be supplemented by examination of symptom associations within the disorder. The estimation of latent variables or unobserved network clusters and variables should be acknowledged as complex and validated through comparison of results on a continual basis (Fried & Cramer, 2017). There are hence several valid conceptualisations of C-PTSD and approaches to estimation. The results of this investigation should be considered in concert with these and in light of notable study limitations;

3.4.2 Limitations

It is argued that the use of two indicators to approximate a factor in CFA may result in an *underidentified factor*, meaning that the presence of a factor is not supported without imposing additional constraints on the model (Rasmussen et al., 2019). Rasmussen et al. (2019) argue that this practice provides relatively weak evidence in support of the model being tested as just- or under-identification disallows testing and revision of the model fit, reducing the reliability of its concept. Despite this critique, results showed very favourable factor loadings for each item onto their respective latent constructs (< .89) suggesting the items within the ITQ to represent

C-PTSD symptomology provide robust indicators of the latent symptom domains (Cloitre et al., 2018; Shevlin et al., 2018). The items selected for final inclusion were subject to rigorous testing for optimal performance (see Cloitre et al., 2018; Shevlin et al., 2018) and informed by a large body of preceding research (Brewin et al., 2017). This prior evidence coupled with the results of the current study the ITQ tentatively appears to be a valid measurement of C-PTSD in the NI veteran population.

Further to this, the high degree of correlation observed between the higher-order PTSD and DSO factors may be argued to be indicative of factors identifying a single construct (de Jongh et al., 2017; Rasmussen et al., 2019). Despite this, resultant fit indices showed the two-factor higher-order model to provide superior fit relative to a single higher-order factor. This indicated that while the PTSD and DSO factors are significantly related there is empirical support for their parsing. Furthermore, a high degree of correlation between these factors is to be expected given the relatedness of these and is observed by previous studies (Hyland, Shevlin, Brewin, et al., 2017). Despite this, the six-factor correlated model was also noted to displaying good fit hence this structure may be a considered a viable alternative conceptualisation of C-PTSD. Future research should continue to acknowledge the potential for both these models to provide a fitting representation of C-PTSD.

Another limitation stems from the relatively homogenous sample used; a military veteran population, limiting the generalisability of results. It is noted that the sample size used in the current study satisfied prior recommendations for identification of factor models of psychopathology in a community population (N. D. Myers et al., 2011). The use of cross validation of findings using large datasets involving the examination of proposed models on randomised subsections of data cases would aid externally validation of findings (Rasmussen et al., 2019). Currently the ITQ is used as a standardised scale and research tool in a variety of populations and contexts across the globe (Karatzias, Cloitre, et al., 2017). While the analysis and findings of this investigation are in line with the study aims of validation in the NI military veteran population, it is suggested that synthesis of these data with others by way of meta-analysis would allow for greater confidence in the conclusions of the current study

and provide trans-population evidence for PTSD and C-PTSD latent factors as measured by the ITQ (see MacCallum et al., 1999).

It should also be acknowledged that endorsement of symptom related functional impairment is an integral aspect of ICD-11 C-PTSD criteria and is omitted from this investigation as in prior factorial and structural studies (Brewin et al., 2017; Knefel, Lueger-Schuster, Bisson, et al., 2019). This study adopted a confirmatory or hypothesis-testing approach, seeking to validate previously evidenced structures thus did not include additional domains. It is recommended that the functional impairment facet of C-PTSD be incorporated in future investigations of the C-PTSD latent concept.

Finally, this investigation is limited by the use of self-report measurement of C-PTSD symptoms as indicators. The ITQ provides the only current empirically evidenced and standardised measurement of ICD-11 C-PTSD symptomology (Cloitre et al., 2018) however the reliance to date on this or other self-report measures as indicators of symptoms may bias factor analytic results. Prior results of factor analysis of DSM-IV PTSD pathology have been shown to vary between self-report and clinical interview data (Palmieri, Marshall, & Schell, 2007). Future research may therefore seek to cross-validate these findings in relation to clinical assessments. On such example is the International Trauma Interview, a clinical schedule related to the validated self-report items presented in the ITQ and following the same diagnostic algorithm (Brewin et al., 2017; Powers et al., 2017).

3.4.3 Conclusions

These results support the factorial validity of the published ITQ consisting of the following domains; *Re-experiencing*, *Avoidance*, *Sense of Threat*, *Affect Dysregulation*, *Negative Self-Concept*, and *Disturbed Relationships* (Cloitre et al., 2018; Shevlin et al., 2018). These six factors loaded onto two second-order factors of PTSD and DSO as proposed by ICD-11 diagnostic criteria, supporting the theoretical concept and diagnostic scoring of these two symptoms domains. These results also concur with previous research finding both first and second order models of C-PTSD

to exhibit acceptable fit (see Cloitre et al., 2018; Hyland, Shevlin, Brewin, et al., 2017). These findings are consistent with a substantiated body of literature in agreement regarding the supported factor structures detailed herein (Hyland, Murphy, Shevlin, et al., 2017; Karatzias et al., 2016; Nickerson et al., 2016; Shevlin et al., 2018).

Contrasting results have however been reported by other research supporting seven first-order factor models; dividing affect dysregulation into *Hyper-* and *Hypo-activation* (see Ben-Ezra et al., 2018; Karatzias et al., 2018). While contemporary literature is consistent with the findings of the current study there remains a need to investigate alternative conceptualisations. Future research should seek to continuously test viable models of C-PTSD incorporating the latest theoretical trends and methodological approaches.

Chapter 4.0;

A Comparison of DSM-5 and ICD-11 Diagnostic Screening for PTSD Among Military Veterans in Northern Ireland

4.1 Introduction

Psychopathological screening typically involves the assessing the presence of symptoms in accordance to criteria for mental health disorders (Brewin, 2005). A great deal of importance is placed on the practice of diagnostic screening by researchers and practitioners as a means to understanding psychological distress (Gates et al., 2012), and to identify individuals in need of therapeutic intervention (Brewin, 2005). The perceived need for effective screening is of particular importance among populations likely to be exposed to potentially traumatic events, such as military veterans (Gates et al., 2012).

As previously discussed (see *Chapter 1.4; Post-Traumatic Stress Disorder*), there are two current diagnostic systems that set the criteria for PTSD diagnostics; the DSM-5 (APA, 2013) and ICD-11 (WHO, 2019c). Many clinical psychological researchers in the UK and NI adhere to *National Institute for Healthcare Excellence* [NICE] guidelines stipulating assessment guidelines using both DSM-5 and ICD-11 diagnostic systems (NICE, 2018). These systems differ in diagnostic criteria required for PTSD diagnosis and also specify different associated diagnostic classifications; PTSD Dissociative and Childhood Subtypes in the DSM-5 (APA, 2013), and C-PTSD in the ICD-11 (WHO, 2019). The current study excludes analysis of the DSM-5 childhood subtype owing to the adult sample used and maintains a focus on the ICD-11 PTSD and C-PTSD diagnoses in relation to DSM-5 PTSD and dissociate sub-type criteria.

C-PTSD was proposed for inclusion in the DSM-5 however at the time it was concluded that there was insufficient evidence to distinguish this as a unique disorder (Resick et al., 2012). Originally published in 2005, C-PTSD was also initially omitted from NICE guidelines. However a revision was subsequently made in December 2018 to recognise the concept of C-PTSD and to recognise the clinical relevance and to establish guidelines for the assessment and treatment of this condition (NICE, 2018). The NICE guidelines are considered gold standard in clinical intervention and research and are supported by rigorous empirical research. Diagnostic differences are recognised in current NICE guidelines. These state there is a need for increased awareness of, and to sufficiently assess the range of outcomes capture by both DSM-5 and ICD-11 criteria (NICE, 2018).

Further to this, there is a particular need for effective screening and categorisation of PTSD diagnostic caseness based on ICD-11 criteria. Although C-PTSD features the core symptoms of PTSD treatment of this can be made difficult by the accompanying DSO symptoms (Bisson et al., 2019). Specific guidelines are developed for differential treatment of C-PTSD (Bisson et al., 2019; Cloitre et al., 2011). Specifically, C-PTSD is argued to benefit from a phase based approach to treatment involving stabilisation, consolidation of memories and sense of self, and finally treatment of issues of engagement with other persons (Bisson et al., 2019; Brewin, 2019). Accurate identification of individuals with C-PTSD is therefore of clinical importance and to the benefit of individual outcomes (Matheson, 2016).

Likewise, the production of epidemiological evidence through symptom screening is beneficial to understanding the relative burden of ICD-11 PTSD and the influence of socio-cultural factors on its pathology (Karatzias, Cloitre, et al., 2017). Authors have noted that given the recent innovation of ICD-11 PTSD and lack of consistent findings across studies there remains a need for greater evidence with regard to C-PTSD prevalence estimation in the general population and across samples (Brewin et al., 2017; Maercker, Hecker, Augsburger, & Kliem, 2018).

Moreover, there is a great deal of interest in how nascent ICD-11 criteria compare to the established DSM-5 criteria for PTSD. A key goal of the ICD-11 revision to PTSD criteria was to narrow and specify diagnosis, a change that has been found to alter the estimated prevalence rates and those who are positively diagnosed (Brewin et al., 2017). Given the substantial divergence in criteria between DSM-5 and ICD-11 PTSD diagnostics, the extent to which these criteria identify the same cases is of great interest. This study considers the evidence in relation to PTSD diagnostic prevalence and concordance for each manual.

4.1.1 PTSD Diagnostic Prevalence

The DSM criteria for PTSD is perhaps the most widely researched conceptualisation of PTSD, with much of the literature and many of the available measures of PTSD informed by this criteria (Brewin, 2005). Results from a representative US general population sample indicate that the lifetime prevalence of DSM-5 PTSD to be 8.3% (Kilpatrick et al., 2013). The results of this study showed that traumatic exposure was almost ubiquitous with 89.7% of the sample reporting at least one potentially traumatic event. The authors additionally note that the presence of multiple traumatic exposures was associated with a significantly increased likelihood of qualifying for PTSD (Kilpatrick et al., 2013).

It should again be highlighted, that evidence supports that rates of PTSD are elevated in NI relative to other countries. Previous research comparing worldwide prevalence statistics related to PTSD estimates NI to have the highest 12-month prevalence rate across WHO participant countries surveyed at 3.8% (Karam et al., 2014). Further to this, there has been a documented high rate of potentially traumatic experiences with 39% of respondents reporting conflict related trauma (Bunting et al., 2013). This study estimated that lifetime prevalence of PTSD caseness was 8.8% in the NI general population with conflict-related trauma associated with greater psychiatric morbidity (Bunting et al., 2013). This would suggest that the NI military veteran population, by function of greater likelihood of conflict related trauma exposure, may be at even further increased risk for PTSD. This survey however used measurement of psychological disorders adhering to ICD-10 and DSM-IV criteria (Kessler & Üstün, 2004). There remains a need for updated contribution using contemporary measures.

While estimated prevalence is relatively low in the general population, in populations where traumatic exposure is more concentrated PTSD pathology is typically observed to be more prevalent. For instance, a systematic review regarding prevalence estimates of DSM PTSD across direct trauma exposed populations indicated that prevalence rates for DSM-5 PTSD symptoms in the previous month ranged from 3.1% to 87.5% with a mean of 25.4% (Santiago et al., 2013). Additionally, Hansen, Hyland, Armour, Shevlin, and Elklit (2015) provide a study of PTSD structure and prevalence

across seven heterogeneous trauma-exposed samples and report a mean DSM-5 PTSD prevalence of 30.5%. These results highlight the fact that the prevalence of PTSD may be significantly increased based on population characteristics and sampling. Indeed, areas of high conflict and '*at risk*' occupational groups have been consistently shown to be at risk for greater PTSD prevalence (Bromet, Karam, Koenen, & Stein, 2018).

Service personnel and veterans are an example of such an '*at risk*' occupational group and have remained a key study population for investigations concerned with PTSD pathology. Prevalence estimates of DSM defined PTSD among US veterans is noted to vary widely across studies owing to the cohorts and methodology employed with rates estimates between 2% and 17% (Richardson, Frueh, & Acierno, 2010). Higher estimates based on DSM-5 criteria have been reported, for instance 38.7% in a sample of US veteran recruited online (Wisco et al., 2016). The estimated prevalence of PTSD among UK armed forces veterans has however been found to be lower than US cohorts with results ranging from 1.3% to 4.8% (MacManus et al., 2014). More recent data from the King's Military Cohort Study however suggests that the prevalence of PTSD in the UK armed forces is increasing. Findings indicate a screening prevalence of 6.2% for PTSD among all veterans, with those deployed in combat roles are significantly greater likelihood of positive screening (Stevelink et al., 2018). This suggests considerable heterogeneity in risk for PTSD symptomology might exist within the veteran population due to past service experiences.

The substantial variability in PTSD prevalence rates even in this specific occupational group may be attributed to pre- and post-deployment factors as well as differential experience of service (Richardson et al., 2010). Results of prior studies, while informative, may not effectively generalise to the NI veteran population. The current investigation aims to provide empirical evidence to address this gap in the literature.

In addition to core DSM-5 PTSD criteria this study considers the prevalence of the *Dissociative Subtype* (D-PTSD). This disorder is defined by PTSD symptomology in addition to experiences of detachment from one's self and surroundings; labelled

depersonalisation and *derealisation* (APA, 2013). This disorder is considered a more severe and chronic form of PTSD relevant for a sub-group of individuals with clinically significant PTSD symptoms (Wolf, Lunney, et al., 2012). This disorder is additionally associated with a great deal of psychological distress and psychiatric comorbidity above traditional PTSD diagnosis (C. Armour, Karstoft, et al., 2014). Evidence from representative population sample suggest that D-PTSD may be experienced by 14.4% of those with PTSD (D. J. Stein et al., 2013). D-PTSD has also been indicated to be a salient issue among veterans with PTSD with 15.6% to 29.9% reporting clinically significant dissociative symptomology (Wolf, Lunney, et al., 2012).

In contrast, the ICD-11 revision to PTSD criteria presents a substantially reduced set of symptoms relative to DSM-5 criteria. This diagnostic category is tailored for greater specificity and hence it associated with lower prevalence estimates (Maercker et al., 2018; O'Donnell et al., 2014). The ICD-11 criteria for PTSD also contains two diagnostic categories; PTSD and C-PTSD, conceptualising these as distinct but closely related disorders (Cloitre et al., 2018). Despite these two disorders considered to be highly related, many early investigations have sought to examine only prevalence of core PTSD criteria (Brewin et al., 2017). Currently the primary established measure for examination of ICD-11 PTSD is the *International Trauma Questionnaire* (ITQ; Cloitre et al., 2018) which assesses both PTSD and C-PTSD symptoms.

Evidence regarding prevalence rates of ICD-11 PTSD generally follow a similar pattern to that outlined above; commonly low in the general population, and higher among trauma exposed and military veteran samples (Wisco et al., 2016). The results of a large-scale online survey conducted in the US community and military veteran populations found rates of past month ICD-11 PTSD 2.4% and 34.4% respectively (Wisco et al., 2016). Wisco et al. (2016) note that these estimates were significantly lower on both occasions when compared to DSM-5 estimates; 3.7% for the community sample and 38.7% for the veteran sample. Hansen et al. (2015) additionally assessed prevalence of ICD-11 PTSD across seven European trauma-exposed samples and found a result of 22.6%, a significantly lower figure compared to the DSM-5 estimate (30.5%). Together these results suggest that ICD-11 PTSD

criteria do identify fewer cases compared to the DSM-5, in line with the goals of this revision (Maercker, Brewin, Bryant, Cloitre, Reed, et al., 2013; Maercker et al., 2018).

C-PTSD has historically been regarded to be more prevalent in clinical and highly traumatised populations (Brewin et al., 2017; Karatzias, Cloitre, et al., 2017). PTSD and C-PTSD are considered distinct diagnostic categories under ICD-11 criteria (Cloitre et al., 2018), and there is therefore a need to consider the prevalence of this diagnosis independently. C-PTSD is typically thought to apply to a more limited sub-set of the population. Indeed, empirical results examining ICD-11 PTSD prevalence in German support this concluding PTSD prevalence to be higher (1.5%) than C-PTSD (0.5%) (Maercker et al., 2018). This however is not a unanimous finding, as rates of C-PTSD have been found to be elevated when compared to ICD-11 PTSD in US samples (Cloitre et al., 2018). This may be attributed to the commonality of multiple potentially traumatic experiences or polyvictimisation as traumatic stress does not frequently occur in isolation (Kilpatrick et al., 2013). Indeed, Cloitre et al. (2018) note that C-PTSD was significantly predicted by multiple interpersonal trauma exposures, suggesting that C-PTSD may represent a unique consideration for a sub-set of the general population. It is likely that the target population of the current study will necessarily endorse conflict related traumas due to previous occupational role and experiences in the military. These may be thought to confer greater risk for C-PTSD, making this condition more relevant than PTSD and elevating prevalence estimates (Mordeno et al., 2019).

Adding to this rationale; there is emerging evidence from a recent study of occupational health and stress conducted among UK police officers reporting elevated prevalence of C-PTSD symptoms compared to PTSD: 11.9% vs. 7.9% respectively (University of Cambridge, 2019). These results tentatively suggest that C-PTSD pathology may be a particularly relevant concern among special occupational groups. However among the limited evidence of C-PTSD in military populations; C-PTSD prevalence among US military veterans was reported to be lower relative to the observed prevalence of ICD-11 PTSD prevalence; 13% vs. 34.4% (Wisco et al., 2016; Wolf et al., 2015). These investigations are limited by proxy measurement of ICD-11

PTSD and C-PTSD criteria to approximate caseness. This practice may introduce error into the estimation of diagnostic prevalence of the disorders (Brewin et al., 2017). In the only study to investigate the use of the ITQ among active duty soldiers in the Philippines once again estimate C-PTSD prevalence to be lower than PTSD; reported as 16.4% and 36.7% respectively (Mordeno et al., 2019). Given the disparity of findings and relative lack of evidence in this area there is a need to further examine the relevance and prevalence of C-PTSD among military veterans.

4.1.2 PTSD Diagnostic Concordance

There exists contrasting evidence regarding the prevalence estimates of PTSD and related diagnostics depending on the application of diagnostic criteria as discussed. There is a vast distinction in the combination of presentations that may result in diagnosis using each diagnostic system. Brewin et al. (2017) note that despite purporting to measure the same construct the items measuring common symptoms present in both systems differ somewhat in their specificity and wording. For instance, the ICD-11 criteria for Re-experiencing symptomology is more specifically operationalised than the DSM-5 Intrusion symptoms requiring endorsement of experiences feeling as if happening '*here and now*' (Brewin et al., 2017). In contrast to this, the DSM-5 criteria allows for *intrusive thoughts and memories* to qualify as symptomatic that do not feature in ICD-11 criteria (Brewin et al., 2017). This difference in diagnostic criteria presented in screening measures may influence the rates of diagnostic concordance between these systems.

It is further noted that there exist 363,120 permutations of symptoms that satisfy diagnosis using the DSM-5 classification system (Galatzer-Levy & Bryant, 2013) while there are 27 possible using ICD-11 criteria (Shevlin et al., 2018). It may therefore be argued that the DSM-5 algorithm lacks clinical utility with so many potentially diverse presentations there is little value in diagnosis owing to the vast heterogeneity in presentation. Conversely, the ICD-11 parsimonious model in symptoms may be too reductive and fail to positively classify clinically significant distress (Hansen et al., 2015). This sub-section discusses conceptual (dis)similarities in PTSD diagnostic categories, contrasting DSM-5 and ICD-11 concepts.

The primary aim of this investigation is to compare the diagnostic concordance of DSM-5 and ICD-11 PTSD diagnostic categories, with particular focus on ICD-11 C-PTSD. In addition, there exist two main methods for screening for PTSD using the PCL-5, a widely used and validated self-report measure for screening DSM-5 PTSD (Bovin et al., 2016). There are using a *cut-off score* or by *applying the DSM-5 algorithm for diagnosis* to symptoms endorsements (Weathers et al., 2013). There is an empirical interest in validation of the use of cut-off scoring of the PCL-5 among UK veterans as the primary source of validation has been in US samples (Murphy, Ross, Ashwick, Armour, & Busuttil, 2017). A supplementary aim of this study is therefore to evaluate the concordance of these methods of screening assessment in relation to DSM-5 criteria.

Previous research comparing the DSM and ICD classification systems in diverse trauma-exposed samples has concluded that PTSD criteria have a satisfactory rate of agreement in terms of diagnostic caseness, 87% (Hansen et al., 2015). The same study also concluded that the reduced number of symptoms used in the ICD-11 did not reduce the utility of diagnosis but rather provided a better model fit to the data for the majority of samples (Hansen et al., 2015). The notable exception was the 'Incest Survivor' sample where the ICD-11 PTSD criteria provide a poorer fit. This was speculated to be due to the fact that the nature of this experience would be more indicative of C-PTSD development and hence was not captured by PTSD.

Comparing DSM-5 and ICD-11 prevalence estimates of PTSD in a treatment seeking veteran sample Kuester et al. (2017) found prevalence estimates of 56% and 48% respectively, a difference noted to be statistically non-significant. Methodological guidance however states that the comparison of estimates should be made with percentage agreement and Cohen's Kappa (κ), a correlational statistic measuring the agreement between independent observers (McHugh, 2012). Statistical comparison of the results of Kuester et al. (2017) showed that concordance was satisfactory between these diagnostic criteria (90%, $\kappa = .801$).

Shevlin et al. (2018) similarly offer an investigation of DSM-5 and ICD-11 PTSD diagnostic prevalence and concordance among internally displaced persons in the Ukraine. The results of this study mirrored those of Kuester et al. (2017), however showed a statistically significant difference in diagnostic prevalence. Shevlin et al. (2018) reported ICD-11 criteria was positively classify fewer individuals than the DSM-5; 21.0% vs. 27.4% respectively. The rate of concordance was also examined in this study with the two systems concluded to display 'substantial' agreement (κ = .64). Similar results were reported by Hyland et al. (2017) finding a higher prevalence of DSM-5 PTSD but a substantial rate of concordance (κ = .69). Despite this Shevlin et al. (2018) critically examine such results arguing that a greater degree of concordance between ratings of the proposed same diagnostic construct may be expected to be higher than that observed in these studies.

While evidence exists in statistical comparison of DSM-5 and ICD-11 PTSD (Hyland et al., 2017; Kuester et al., 2017; Shevlin et al., 2018), studies have neglected to examine the possible concordance or overlap of DSM-5 PTSD, D-PTSD, and C-PTSD. There are conceptual and theoretical grounds to the consideration of the diagnostic similarity of C-PTSD and DSM-5 diagnostics.

The removal of non-specific symptoms in ICD-11 criteria compared to DSM-5 criteria leaves common symptom clusters between the systems describing re-experiencing, avoidance, and hyperarousal (O'Donnell et al., 2014). Many of those indicators not mirrored in ICD-11 criteria are the symptom criteria present in the DSM-5 NACM symptom cluster [Criterion D]. These symptoms have however been conceptually likened to aspects of DSO present in ICD-11 criteria for C-PTSD (Landy, Wagner, Brown-Bowers, & Monson, 2015). Friedman (2013) similarly notes a trend within DSM-5 criteria toward incorporation of previous '*DESNOS-ish*' symptoms into core PTSD diagnostic criteria. It is possible in the revision and broadening of PTSD criteria by the APA has served to inadvertently capture experiences of C-PTSD and incorporate these within core DSM-5 PTSD symptomology. Indeed, psychometric validation of the ITQ indicated that the items and latent factors associated with DSO

were highly and significantly correlated with the DSM-5 NACM symptom cluster (Karatzias et al., 2016).

Landy et al. (2015) in a review of the ICD-11 proposals for PTSD elaborate on specific comparability of DSM-5 criteria; Negative beliefs about oneself and the world, self-blame, and persistent negative affect, all of which may be considered indicative of the NSC concept. Similarly, indicators of NACM presented in the PCL-5 (Weathers et al., 2013) may be conceptually likened to the AD and DR constructs present in C-PTSD criteria namely; aggression and irritable behaviours, and feeling distant or cut-off from other people. This provides rationale to consider the conceptual and potential diagnostic overlap of the DSM-5 PTSD and ICD-11 C-PTSD criteria.

Finally considered is the diagnostic concordance of DSM-5 D-PTSD and ICD-11 C-PTSD. Both C-PTSD and D-PTSD have been linked to experiences of multiple and severe interpersonal traumas, particularly in childhood (Hagan, Gentry, Ippen, & Lieberman, 2018). The DSO domains that form C-PTSD criteria have been noted to be conceptually linked to dissociation (Cloitre et al., 2009; Dorahy et al., 2015). It has been argued that in circumstances where traumatic exposure are particularly distressing or inescapable, i.e. Complex Trauma (J. L. Herman, 1992), dissociation may be employed to escape or cope with these feelings (Madan, Bellin, & Haden, 2015). Indeed, the symptoms described by C-PTSD may be argued to be manifestations of internal cognitive and structural dissociations (van der Hart, Nijenhuis, & Steele, 2005). For example, Negative Self-Concepts may be considered related to aspects of dissociation such as *cognitive distortions*. Negatively biased cognitive distortions and catastrophizing may lead to severely diminished sense of self and negative self-belief (Collett, Pugh, Waite, & Freeman, 2016). Clinicians have also noted that other characteristics of dissociation, such as derealisation, commonly feature in C-PTSD presentations (Brewin, 2019; Cloitre et al., 2011).

Childhood traumatic exposure and emotional dysregulation, both aspects of C-PTSD, are also associated with dissociation and PTSD with emotion dysregulation found to partially mediate the relationship between the two (Powers, Cross, Fani, & Bradley,

2015). In a survey of treatment-seeking childhood abuse survivors it was found that dissociative symptoms were associated with significantly greater shame and interpersonal difficulties; two central aspects of the DSO domains of C-PTSD (Dorahy et al., 2015; Shevlin et al., 2018). Additionally, it has been found that respondents who met criteria for C-PTSD, but did not report symptoms of dissociation, remained significantly likely to experience relational problems (Dorahy et al., 2015). These findings suggest that dissociation may be conceptually related to C-PTSD, but is not inextricably linked to DSO symptoms.

Powers et al. (2017) additionally note that in a sample of US trauma-exposed African American women 36.4% of those who met caseness for C-PTSD also screened positive for DSM-5 D-PTSD. These results suggest that there may exist some overlapping expression of post-traumatic symptoms that constitute Complex and Dissociative PTSD. Both D-PTSD and C-PTSD have also been linked to increased psychiatric comorbidity (Powers et al., 2017; van Huijstee & Vermetten, 2017). Indeed, it has been found dissociative PTSD experiences are associated with greater psychiatric comorbidity with BPD (Wolf, Miller, et al., 2012). Many symptoms of BPD are conceptually similar to those disturbances in self-organisation described by current C-PTSD pathology (Cloitre et al., 2013), tentatively suggesting commonality between dissociative and C-PTSD symptoms.

As previously noted, evidence supports the linkage of both C-PTSD and dissociative symptoms to experience childhood trauma (Cloitre et al., 2009; Cook et al., 2005). This evidence is however contrasted by the results of a recent community survey conducted with Canadian adults; Frewen, Zhu, and Lanius (2019) conclude that C-PTSD and D-PTSD were differentially predicted by lifetime traumatic experiences. While Adverse Childhood Experiences [ACEs] and cumulative lifetime trauma were associated with increased pathology for all PTSD diagnostics, C-PTSD was found to be more strongly associated with ACEs and D-PTSD was associated more so with total lifetime traumatic exposure (Frewen et al., 2019). These findings suggest that there may exist a differentiated aetiology or cause of these disorders.

Despite conceptual similarities in the aetiology and nosology of D-PTSD and C-PTSD discussed, these disorders have been rigorously validated and differentiated by

specific symptom prescriptions in their respective manuals (Giourou et al., 2018). There is however a lack of investigations seeking to examine the potential concordance or discordance of the newly founded C-PTSD diagnostic criteria and those already established. Owing to this lack of empirical evidence, and the evidence presented herein suggesting the conceptual similarities between C-PTSD and DSM-5 PTSD and D-PTSD rationale is provided to compare and contrast these diagnostic concepts.

4.1.3 Research Aims

The purpose of this chapter is to examine the utility of ICD-11 criteria of PTSD and C-PTSD diagnostic screening within the NI military veteran population. As the ITQ (Cloitre et al., 2018) has become publicly available, this marks an opportunity to compare the utility of this recently validated measure to the established PCL-5 and add to the substantiation of evidence comparing PTSD screening. The aims of this study are two-fold:

i. Firstly, to examine and compare the prevalence estimates produced by screening methods for PTSD diagnostics in a NI veteran sample. Given the prior evidence presented herein it is expected that the ICD-11 PTSD criteria will produce a lower prevalence estimate than the DSM-5 criteria. Furthermore, a higher ICD-11 C-PTSD caseness prevalence is expected to be observed relative to ICD-11 PTSD caseness.

ii. Secondly, to investigate diagnostic concordance, i.e. agreement in identification of caseness, between DSM-5 and ICD-11 diagnostic categories. These are evaluated and discussed based on statistical and conceptual (dis)similarity with particular focus on the relationship between ICD-11 C-PTSD and DSM-5 diagnostic categories. It is hypothesised that despite conceptual similarity C-PTSD will be empirically distinguished from other PTSD diagnostics. A supplementary aim is to evaluate the application of algorithm and cut-off caseness evaluation of DSM-5 PTSD screening given that availability of data and thematic consistency with the overall goals of this study.

4.2 Methodology

4.2.1 Measures

Relevant *demographic information* related to personal characteristics and characteristics of military service are captured using the demographic items included in the first section of the NIVHWS survey.

DSM-5 PTSD is measured by the PTSD Checklist 5 (PCL-5; Weathers, Litz, Keane, Palmieri, Marx, & Schnurr, 2013). This measures also included two additional items adapted from the Clinician Administered PTSD Scale (CAPS-5; Weathers et al., 2018) to measure dissociative symptoms related to trauma, namely depersonalisation and derealisation. The PCL-5 was confirmed to have excellent internal reliability both alone (α = .979) and with the addition of two CAPS items (α = .980). Two methods of case determination using the PCL-5 are applied in this study and detailed below.

Firstly, summing the response score of all 20 items and dichotomously categorising individuals based on a determined cut-off score (Wortmann et al., 2016). The remains considerable variation in the cut-off scores deemed appropriate to identify PTSD caseness using this method with values ranging from 28 to 37 (Ibrahim, Ertl, Catani, Ismail, & Neuner, 2018a). Data from an investigation conducted with treatment seeking UK veterans compared PCL-5 scores against clinician evaluation supported the application of a cut-off score of *34* points (Murphy et al., 2017). This value was selected for use in the current study given the comparability in study populations (UK veterans).

Secondly, caseness may be determined with adherence to DSM-5 diagnostic guidelines; requiring endorsement of one Re-experiencing [B criterion] symptom, one Avoidance [C criterion] symptom, two Cognitions and Mood [D criterion] symptoms, and two Arousal and Reactivity [E criterion] symptoms to be endorsed "*Moderately*" [2] or above (Wortmann et al., 2016). This method of scoring is typically used in administration of the CAPS, regarded as the gold standard in PTSD assessment (Murphy et al., 2017). Algorithmic scoring of the PCL-5 to identify caseness is an established practice within the literature (Liu et al., 2014; Murphy, Hansen, et al.,

2018). Previous evidence supports the use of algorithm scoring as more sensitive and accurate at PTSD case identification (Geier, Hunt, Nelson, Brasel, & DeRoon-Cassini, 2019). Researchers however argue that application of optimal cut-off scores should perform equally well in PCL-5 diagnostic screening (Wortmann et al., 2016).

This investigation uses the diagnostic caseness algorithm for PTSD as outlined above to determine caseness of D-PTSD. This is characterised by core PTSD symptomology and endorsement of *Depersonalisation* and *Derealisation*. Endorsement of these symptoms is similarly defined by a response of "*Moderately*" [2] or above, a standard specified for use with the CAPS from which D-PTSD items are adapted in this study (C. Armour, Karstoft, et al., 2014; Blake et al., 1995).

ICD-11 PTSD and *C-PTSD* is measured using the International Trauma Questionnaire (ITQ; Cloitre et al., 2018). This measure is comprised of 12 items; six measuring core PTSD symptomology and six measuring DSO symptoms. The ITQ was found to have excellent internal reliability in the current sample on each sub scale; on each subscale; Re-experiencing (α = .932), Avoidance (α = .942), Sense of Threat (α = .905), Affect Dysregulation (α = .880), Negative Self-Concept (α = .969), and Disturbances in Relationships (α = .901).

Diagnosis of PTSD and C-PTSD are necessarily mutually exclusive and hierarchical; only one of these diagnoses may be held at any time (Cloitre et al., 2018). The ITQ is used to assess the probable presence of these disorders and the principle of mutual exclusivity is applied to scoring and screening procedures in this study. Response items on the ITQ similar to the PCL-5 relate to the degree of distress caused by symptoms in the past month are scored from *0* "*Not at all*" to *4* "*Extremely*". *Endorsement* is considered as a score of 2 "*Moderately*" or more on any item (Cloitre et al., 2018).

PTSD diagnostic caseness using this measurement system demands endorsement of at least one (of two) symptom(s) in each category; Re-experiencing, Avoidance, and Sense of Current Threat. The respondent must similarly endorse a "*Moderate*" [≥2]

degree of distress or functional impairment one at least one (of three) indicator(s) caused by these difficulties.

C-PTSD caseness necessitates the previous criteria be met in addition to endorsement [≥2] of one (of two) symptom(s) in each DSO category; Affect Dysregulation, Negative Self-Concept, and Interpersonal Difficulties. Similarly, functional impairment in one domain of life as a result of these difficulties must also be endorsed.

4.2.2 Participants

The effective sub-sample in this study was comprised of *N* = 359 responses. The age of respondents ranged from 27 to 86 (*M* = 54.87, *SD* = 11.38). The majority were male (89.4%), had served in the Army (86.6%), and had reached a highest rank of Non-Commissioned Officer (55.7%). Further to this it was noted that approximately half of respondents endorsed home service in NI in the UDR or Royal Irish Regiments (49.6%).

Table 4.1; Chapter Four Participant Demographic Information, N = 359

Variable	***n* (%)**
Gender/Sex	
Male	321 (89.4)
Female	38 (10.6)
Marital Status	
Single/Widowed/Separated	94 (26.2)
Married/In Relationship	265 (73.8)
Educational Attainment	
No Qualifications	60 (16.7)
GCSE*	100 (27.9)
A-level*	32 (8.9)
Higher Education Diploma*	62 (17.3)
Bachelors or Post-Graduate Degree*	93 (25.9)
Other Professional Qualification	11 (3.1)
Refused/Missing	1 (0.3)
* *Or equivalent qualification*	
Employment	
Unemployed	13 (3.6)
Self Employed	22 (6.1)
Employed (Full-time)	141 (39.3)
Employed (Part-time)	22 (6.1)
Student/Full-time Education	7 (1.9)

Unable to Work	30 (8.4)
Retired	75 (20.9)
Medically Retired	42 (11.7)
Full-time Carer	6 (1.7)
Refused/Missing	1 (0.3)
Branch	
Royal Navy	17 (4.7)
Royal Marines	7 (1.9)
Army	311 (86.6)
Royal Air Force	24 (6.7)
Rank	
Officer	62 (17.3)
Non-Commissioned Officer	200 (55.7)
Other Ranks	97 (27.0)
Time in Regular Service	
Never	30 (8.4)
Less than One Year	2 (0.6)
Up to 10 years	124 (24.5)
11-20 Years	104 (29.0)
20+ Years	96 (26.7)
Refused/Missing	3 (0.8)
Time in Reserve Service	
Never	154 (42.9)
Less than One Year	14 (3.9)
Up to 10 years	120 (33.4)
11-20 Years	28 (7.8)
20+ Years	24 (6.7)
Refused/Missing	19 (5.3)
Current reservist	
Yes	34 (9.5)
No	325 (90.5)
Service in Northern Ireland	
Yes	178 (49.6)
No	180 (50.1)
Refused/Missing	1 (0.3)

4.2.3 Data Analytic Plan

A total of *N* = 903 responses were captured by the online survey, of which *n* = 319 (35.3%) were found to not begin or provide consent to participate. Data were assessed for missingness on study variables and were found to be Missing Completely at Random (Little's MCAR Test; $\chi 2$ (724, *n* = 584) = 667.054, *p* = .893). Cases with less than 20% of missing values were retained for analyses, an acceptable inclusion criterion where data are MCAR (Schlomer, Bauman, & Card, 2010). This procedure

led to the further exclusion of *n* = 225 cases and yielded a final effective sample for use in this study of *N* = 359. Key variables were non-normally distributed and hence the Mann-Whitney U test was used to compare those included to those excluded from analyses. No significant differences were found between groups with regard to mean response on ITQ items, however significant differences were observed on mean response to a number of PCL-5 items. The potential for bias in estimation and results due to non-response on some items should therefore be noted. Full results are detailed in Appendix 3.1.

Given the necessity for computation of diagnostic scores item level missing values partial missing data were imputed using the Expectation Maximisation (EM) function in SPSS. The EM method of imputation is considered a robust and appropriate method of value replacement using available information where there are low amounts of partial missingness and data are missing at random (Enders, 2003).

Using the procedures for evaluating probably diagnosis detailed previously (see *Chapter 4.2.1; Measures*) probable caseness was computed for each case and binary coded [0 = No Caseness, 1 = Caseness Met]. Effective prevalence rates for the sample population were calculated through descriptive statistics. Resultant estimates relating to DSM-5 and ICD-11 algorithm scoring for PTSD are compared using McNemar's test, a bivariate method of comparison deemed appropriate to test diagnostic status discordance (Trajman & Luiz, 2008; Vasileva, Haag, Landolt, & Petermann, 2018).

Diagnostic concordance or over-lap was measured by proportion of individuals classified as cases by both diagnostic algorithms (% agreement). Cohen's Kappa (κ) was also calculated for each pairing assessing the level of agreement between observations. This correlational statistic is used typically to assess the reliability or agreement of independent observations (McHugh, 2012). Increasing values of this statistic (≤ 1) are indicative of more substantive agreement. Confidence intervals for each resulting Kappa were calculated using the formula published by McHugh (2012).

While the use of cut-off or categorical values of Kappa is largely arbitrary (Sim & Wright, 2005) the following scale of concordance proposed by McHugh (2012) is applied in this study to guide interpretation; >.2 = *No Agreement*, .21-.39 = *Minimal*, .40-.59 = *Weak*, .60-.79 = *Moderate*, .80-.90 = *Strong*, .90+ = *Near Perfect*. This guidance further states that a result of less than .60 is indicative of *inadequate* agreement (McHugh, 2012). The valid use of this statistic for analysis of diagnostic concordance has been established by previous research (Hyland, Murphy, et al., 2017; Kuester et al., 2017; Shevlin et al., 2018; Vasileva et al., 2018).

4.3 Results

4.3.1 Prevalence

Prevalence of DSM-5 PTSD and D-PTSD is presented in Table 3. It was found that 42.6% of the sample screened positive for PTSD using the DSM-5 algorithm, a lower estimated prevalence relative to using a cut-off score of 34 (43.7%) but, as the results of a McNemar Test showed, statistically non-significant (χ^2 (1, N = 359) = 254.09, p = .572). Of those who met the PTSD criteria according to the DSM-5 symptom algorithm 26.2% endorsed dissociative symptoms of both depersonalization and derealisation, thus meeting criteria for the D-PTSD subtype.

Table 4.2; Prevalence Statistics for DSM-5 PTSD and D-PTSD Symptom Endorsements

Caseness	N (%)
PTSD (Cut-off)	157 (43.7)
PTSD (Algorithm)	153 (42.6)
A. Stressor	359 (100)
B. Intrusion	203 (56.5)
C. Avoidance	182 (50.7)
D. Negative Alterations in Cognition and Mood	197 (54.9)
E. Alterations in Arousal & Reactivity	208 (57.9)
D-PTSD (Total)	94 (26.2)
Depersonalisation	121 (33.7)
Derealisation	111 (30.9)

Aspects of core PTSD symptomology were endorsed by over half the sample with caseness being met most frequently for the Alterations in Arousal and Reactivity symptom cluster (57.9%). Dissociative symptoms were endorsed less frequently than core PTSD symptoms but remained an issue for approximately one third of participants.

Results of a McNemar's Test revealed that the rate of ICD-11 PTSD (32.3%) was significantly lower than that produced by the DSM-5 algorithm criteria (42.6%) (χ^2 (1, N = 359) = 28.80, p < .001). While 32.3% of respondents met criteria for PTSD according to ITQ algorithmic scoring, the majority of these further qualified for diagnosis of C-PTSD based on responses to DSO items (25.3%). As a result of this, the effective prevalence estimate for ICD-11 PTSD diagnosis in the current sample is 7.0% as C-PTSD acts as a superordinate diagnosis (Cloitre et al., 2018).

Table 4.3; Prevalence Statistics for ICD-11 PTSD and C-PTSD Symptom Endorsements

Caseness	N (%)
PTSD (Total)	116 (32.3)
PTSD Only	25 (7.0)
Re-experiencing	166 (46.2)
Avoidance	161 (44.8)
Current Threat	194 (54.0)
Functional Impairment (PTSD)	156 (43.5)
C-PTSD	91 (25.3)
Affect Dysregulation	196 (54.6)
Negative Self Concept	139 (38.7)
Interpersonal Difficulties	184 (51.3)
Functional Impairment (DSO)	150 (41.8)

Inspection of symptom cluster caseness shows slightly lower endorsement relative to comparable DSM-5 symptom clusters. However similar to DSM-5 Alterations in Arousal and Reactivity criteria, the ICD-11 Sense of Threat was found to be the most prevalent symptom domain (54.0%). Among DSO domains; criteria were met for Affect Dysregulation and Disturbed Relationships for over half of participants while Negative Self-Concept was endorsed by 38.7%. Functional impairment in relation to both PTSD and DSO symptomology was generally endorsed less frequently than the symptoms themselves.

4.3.2 Concordance

Guided by published standards of reporting (see McHugh, 2012; Sim & Wright, 2005) the rates of agreement between screened classification is specified and compared using Percentage Agreement (PA) and Cohens Kappa (κ) between each diagnostic pairing of interest previous outlined.

Table 4.4; Comparison of DSM-5 Algorithm and Cut-off Caseness Estimates, N = 359

	DSM-5 Algorithm (*n, %*)	
DSM-5 Cut-off [34] (*n, %*)	Case Not Met (*206, 57.4*)	Case Met (*153, 42.6*)
Case Not Met (*202, 56.3*)	190 (52.9%)	12 (3.3%)
Case Met (*157, 43.7*)	16 (4.4%)	141 (39.2%)

Concordance between the measurements of DSM-5 PTSD (*Algorithm* vs. *Cut-off*) was favourable, indicating strong agreement between classification methods (PA = 92.2%, κ = .841, 95%CI = .784-.900, p < .001). A total of 169 cases were positively classified by either measurement. Of these cases, 28 (16.6%) were positively classified in contrast with the comparative measurement; 16 (9.5%) by *Algorithm* and 12 (7.1%) by use of *Cut-off*. These results suggest substantial agreement and hence the reliability of using both the cut-off and the diagnostic algorithm for the purposes of screening and to estimate the prevalence of DSM-5 PTSD.

Table 4.5; Comparison of ICD-11 and DSM-5 PTSD Caseness Estimates, N = 359

	DSM-5 Algorithm (*n, %*)	
ICD-11 PTSD (*n, %*)	Case Not Met (*206, 57.4*)	Case Met (*153, 42.6*)
Case Not Met (*243, 67.7*)	202 (56.3%)	41 (11.4%)
Case Met (*116, 32.3*)	4 (1.1%)	112 (31.2%)

Concordance between *DSM-5 PTSD* and *ICD-11 PTSD* was assessed using algorithmic measures of both systems for the purposes of more direct comparison. The rate of agreement was found to be acceptable and moderate (PA = 87.5%, κ = .735, 95%CI = .664-.810, p < .001). In total 157 participant met caseness for at least one diagnosis, with *n* = 45 (28.7%) meeting criteria for only one and not the other. Four participants (2.5%) met caseness only for ICD-11 PTSD and 41 (26.1%) met caseness for only DSM-5 PTSD. This rate of concordance is comparable to the results of previous studies comparing ICD-11 and DSM-5 PTSD criteria (Kuester et al., 2017).

Table 4.6; Comparison of ICD-11 C-PTSD and DSM-5 PTSD Caseness Estimates, N = 359

	DSM-5 Algorithm (*n, %)*	
ICD-11 C-PTSD (*n, %*)	Case Not Met (*206, 57.4*)	Case Met (*153, 42.6*)
Case Not Met (*268, 74.7*)	202 (56.3%)	66 (18.4%)
Case Met (91*, 25.3*)	4 (1.1%)	87 (24.2%)

The rate of concordance between *ICD-11 C-PTSD* and *DSM-5 PTSD* caseness was low, below the threshold of acceptability (PA = 80.5%, κ = .579, 95%CI = .497-.661, p < .001). In total 157 participants met caseness for at least one classification, of these *n* = 70 (44.6%) were noted to be discordant. C-PTSD criteria uniquely identified *n* = 4 cases while DSM-5 PTSD criteria uniquely identified *n* = 66 cases not positively classified by C-PTSD criteria.

Table 4.7; Comparison of ICD-11 C-PTSD and DSM-5 D-PTSD Caseness Estimates, N = 359

	DSM-5 D-PTSD (*n, %)*	
ICD-11 C-PTSD (*n, %*)	Case Not Met (*265, 73.8*)	Case Met (94*, 26.2*)
Case Not Met (*268, 74.7*)	242 (67.4%)	26 (7.2%)
Case Met (91*, 25.3*)	23 (6.4%)	68 (18.9%)

Concordance between *C-PTSD* and *D-PTSD* was found to be moderate, higher than that between C-PTSD and DSM-5 PTSD but lower than that of the two measurements of PTSD criteria (PA = 86.4%, κ = .643, 95%CI = .551-.735, $p < .001$). A total of 117 participants met caseness for at least one disorder with *n* = 68 (55.5%) of these found to be concordant. Hence, *n* = 49 were positively categorised by one criterion but not the other. Of these 26 (22.2%) were positively classified by only D-PTSD criteria and 23 (19.7%) by only C-PTSD caseness.

4.4 Discussion

This investigation endeavoured to examine the prevalence and concordance of diagnostic screening for DSM-5 and ICD-11 PTSD diagnostics. Consistent with prior research, results showed that the DSM-5 criteria positively identified more PTSD cases (42.6%) compared to ICD-11 criteria (32.3%). The finding that DSM-5 criteria produce higher prevalence estimates of PTSD caseness relative to the ICD-11 is consistent with extant literature. The primary theorised reason for this is the narrowing of symptoms in the ICD-11 revision (O'Donnell et al., 2014). O'Donnell et al. (2014) note that among the trauma-exposed sample studied 42% (*n* = 15) of PTSD cases met criteria for both disorders, however a number met criteria for only DSM-5 criteria (*n* = 19, 53%). These results in conjunction with those of the current study suggest that the DSM-5 criteria positively classify a considerable number of PTSD cases not classified by the ICD-11.

This may have implications for the estimation of PTSD burden in epidemiological research and diagnostic screening. Where the DSM-5 are applied it can be expected a significantly greater number of individuals will be recognised as probable PTSD cases, possibly skewing results of studies utilising this method. It has been equally suggested that the DSM-5 criteria remain too broad, over-identifying probable cases that may otherwise be considered normal distress, or the ICD-11 criteria be considered too restrictive, failing to identify genuine PTSD cases (Hansen et al., 2015). Further to this researchers have argued the use of diagnostic screening absent evaluation of impairment and clinical significance of symptoms to lead to inflated caseness estimates (Charlson et al., 2019). Additional investigation of the effects of diagnostic screening criteria are hence required in conjunction with clinician evaluation to discern the true screening identification of these systems.

The prevalence rates of probable PTSD identified in the current population are notably higher that that previously noted among UK Armed Forces Veterans (see MacManus et al., 2014). This finding may be attributed to the novel mode of service reported by approximately half of participants; home service in NI. Indeed, prior

research has indicated that the nature of the civil conflict in NI has contributed significantly to increased PTSD prevalence among the general public (Ferry et al., 2014). It should however be noted that the elevated combined prevalence of ICD-11 PTSD was comparable to that found among Filipino armed forces; 36.7% (Mordeno et al., 2019), and a sample of US veterans recruited online; 38.7% (Wisco et al., 2016). It is however noteworthy that the prevalence of C-PTSD caseness relative to PTSD was high in the current investigation compared to the results of Mordeno et al. (2019); 16.4% vs. 25.6%, and to those in the US veteran sample; 13% vs. 34.4% (Wolf et al., 2015). Indeed, evidence from investigation of Israeli ex-POW's and veterans not formerly captured has shown C-PTSD to be more prevalent than PTSD for the former, and not the latter group (Palic et al., 2016). High endorsement of DSO symptoms and probable C-PTSD caseness found may be considered indicative of their particular relevance for this population where pervasive trauma is experienced. It is argued that the high prevalence of C-PTSD over PTSD diagnosis in particular populations is supportive of holding it as a distinct diagnostic status (Brewin et al., 2017).

Wolf et al. (2015) similarly finding that over half of ICD-11 PTSD cases qualified C-PTSD offer a contrasted conclusion, arguing this to undermine the distinction of C-PTSD. The findings of Wolf et al. (2015) however showed that relative to a US community sample military veterans with and without PTSD more frequently endorsed DSO symptoms. Given then high endorsement of DSO symptoms between these studies, It is suggested that population characteristics relevant to veteran status may contribute to greater DSO morbidity and increased relevance of C-PTSD. It is possible that the experience of conflict and prolonged period of dangerous activities contribute both to PTSD and to DSO symptoms (Courtois & Ford, 2019). Future research should explore population and contextual factors that may contribute to ubiquity of C-PTSD relative to traditional PTSD diagnosis.

The current sample derived from a heterogeneous community sample may be expected to underrepresent C-PTSD caseness as those experiencing the greatest distress, i.e. more likely to fully endorse C-PTSD symptomology, may be concentrated

in clinical populations and not be fully captured by this sampling approach (Brewin et al., 2017). Conversely, there is evidence that a significant subset of those experiencing C-PTSD symptomology may cope positively in daily life for extended periods of time compensating for distress experienced through DSO symptoms (see Stadtmann et al., 2018). Indeed, recent evidence from the UK has suggested that C-PTSD may be more prevalent than PTSD in trauma-exposed community samples (Karatzias, Hyland, et al., 2019). A larger contingent of C-PTSD cases found in community or non-clinical samples as in this study is therefore not considered overly surprising. Equally it might be argued that self-selection bias might be introduced, inflating estimated prevalence as a greater number of individuals experiencing psychological distress might be inclined to participate in a known psychological health study (Eysenbach & Wyatt, 2002). Further research examining prevalence rates of C-PTSD may consider stratifying sampling within groups exposed to trauma or with special occupational status in order to estimate more effectively.

Similar to previous investigations of the D-PTSD sub-type among military veterans, this condition was found to be a relevant consideration for subgroup of DSM-5 PTSD cases (Waelde, Silvern, & Fairbank, 2005; Wolf, Lunney, et al., 2012). Once again, the proportion of individuals probably qualifying for this more specified diagnosis was found to be higher than in previous investigations with military veterans; 61% vs. 30% (Waelde et al., 2005). Lanius, Brand, Vermetten, Frewen, and Spiegel (2012) note that dissociative pathology is most commonly associated with chronic and interpersonal traumatic exposure. It may hence be argued that the effects of prolonged threat and conflict in the current population contribute to the higher prevalence of D-PTSD observed. Likewise, D-PTSD is typically associated with profiles of more severe PTSD symptomology (Wolf, Lunney, et al., 2012). As the prevalence of PTSD symptomologies was generally high in this sample it may also be argued that the relative burden of psychological distress yielded a concentration of accompanying dissociative symptoms, and thus higher estimated prevalence of D-PTSD. Furthermore, Lanius et al. (2012) similarly note that chronic PTSD cases are more likely to endorse dissociative symptomology. Hence those probable cases identified may be more likely to be chronic and exhibit dissociative symptomology given the

nature of the study sample; i.e. older, military veteran, and experiencing past month PTSD pathology.

Subsequently considered in this study was the concordance or agreement between screening criteria;

The cut-off and algorithmic probable caseness identification using the PCL-5 were found to produce a '*Strong*' degree of agreement, suggesting a high likelihood of both approaches identifying the same individuals and reliability of these relative to each other (Kwiecien, Kopp-Schneider, & Blettner, 2011). The rate of screening concordance between the DSM-5 Algorithmic and ICD-11 criteria for PTSD was found to be '*Adequate*'. Inspection of all metrics of agreement upheld this assertion (McHugh, 2012; Sim & Wright, 2005) and it was concluded, consistent with expectations, that the DSM-5 and ICD-11 PTSD screening criteria appear to identify a common construct.

These results show that despite the substantially reduced symptom indicators and significantly lower prevalence estimate associated with the ICD-11 PTSD criteria this continues to represent a valid and satisfactory diagnostic concept of PTSD. Hence this more parsimonious grouping of reduced symptoms may be considered efficacious relative to the DSM-5 method of PTSD screening (Kuester et al., 2017). It should however be noted that despite adequate concordance a number of individuals may be erroneously classed as non-cases due to the increased specificity of ICD-11 PTSD criteria. It is therefore suggested once again that future research examine the concordance of diagnostic screening and clinician evaluation in the NI military veteran population to add greater confidence in accurate identification of probable PTSD cases using screening methods.

The percentage agreement between DSM-5 PTSD and ICD-11 C-PTSD was found to be high in the current study, however this result may be inflated by the number of non-cases and common categorisation of these as such. As percentage agreement is vulnerable to such distortion the additional interpretation of Cohen's Kappa provides more robust understanding of concordance (Sim & Wright, 2005). Greater weight

was therefore assigned to this result in interpretation. Results of this statistic showed a '*Weak*' level of agreement between categories indicating discriminant validity between them. Although some degree of overlap was identified between diagnostic cases a large number were positively classified uniquely by the broader DSM-5 PTSD criteria, and not by ICD-11 C-PTSD. In other words, despite the previously noted conceptual similarities between the NACM symptom cluster and C-PTSD criteria (Friedman, 2013; Karatzias et al., 2016; Landy et al., 2015), the ICD-11 C-PTSD screening criteria appear to largely identify a unique syndrome and a different group of individuals.

Finally, screening for ICD-11 C-PTSD was found to produce similar prevalence estimates to that of DSM-5 D-PTSD. Upon inspection of concordance statistics it was found these criteria produced a '*Moderate*' rate of agreement, indicating a relative degree of commonality in those identified by these screening criteria. It is noteworthy that the resultant rate of agreement was considered '*Moderate*' however inspection of the 95% confidence intervals for Cohen's Kappa revealed that lower bounds fell below the predetermined threshold of acceptability; .60, indicating '*Weak*' agreement (McHugh, 2012). It was therefore concluded these findings are indicative of tentative discrimination between C-PTSD and D-PTSD screening criteria however a reasonable degree of concordance exists between these disorders. This observation may be attributable to greater impairment associated with both conditions, or to commonality or comorbidity in symptoms beyond PTSD pathology (Cloitre et al., 2013; Powers et al., 2017; Wolf et al., 2012).

The finding of the shared commonality between these diagnostic categories has implication for conceptual understanding and clinical decision making. The conceptually similar symptoms described by both C-PTSD and D-PTSD may be considered problematic as these may confuse diagnosis and comorbidity. For example, some aspects of dissociation such as cognitive distortions are considered indicative of BPD, a condition conceptually links to C-PTSD (Cloitre et al., 2014; Giourou et al., 2018). It is therefore imperative that accurate screening and diagnosis take place to accurately identify disorder cases to best allocate individuals to effective treatment.

Factors of Emotion Dysregulation and Dissociation similarly have important implications for treatment as these symptoms are generally regarded as being indicative of greater functional impairment and treatment resistance in trauma-exposed populations (Cloitre et al., 2011; Powers et al., 2017). There are a number of potential trauma-focused interventions that may be applied to cases with dissociative and complex PTSD elements to different efficacy (Vermetten & Spiegel, 2014). The presence of pervasive dissociation and emotion regulation difficulties may indeed cause significant distress and immediate threat to the individual with C-PTSD (Brewin, 2019). There may therefore be a need to address these pertinent issues before proceeding to address C-PTSD symptomology (Brewin, 2019). Given the multifaceted relationship between dissociation and C-PTSD pathology there is a unique challenge in definition and formulation for clinicians in classification of such cases (Nijenhuis & van der Hart, 2011).

4.4.1 Implications

These results highlight the potential for the use of different diagnostic criteria and indicators to screen for PTSD symptoms to influence diagnostic categorisation, and prevalence estimation. This has important implications for the epidemiological understanding of PTSD diagnostics and for clinical formulation.

Firstly, the implications for conceptual understanding of PTSD diagnostics; Hansen et al. (2015) note that the presence of two disparate and competing concepts of a single disorder leads to difficulty in understanding its nature and the distress experienced by individuals. The results herein highlight that core PTSD criteria between manuals demonstrates adequate agreement however some disparity does exist demonstrating conceptual differences do indeed exist, particularly in the associated diagnose of D-PTSD and C-PTSD. Integrative understanding of PTSD is hence necessarily contributed to by evidence derived from both systems.

Secondly, implications for epidemiological investigation of PTSD; these results demonstrate the potential for screening method to potentially bias the results of

epidemiological data. Results of studies using differential measures may over- or under-representing the true burden of PTSD, and limit the extent to which figures may be compared. The use of the DSM criteria in the form of PCL cut-off screening remains the most widely used approach to quantifying PTSD caseness in military populations (Polusny et al., 2016). These results contribute to the body of literature evidencing the disparate prevalence estimates arising from use of different diagnostic manuals (D. J. Stein et al., 2014). There is therefore a need to critically examine the methods using in reaching epidemiological estimates of PTSD and the potential biases these may introduce, particularly in the examination and synthesis of evidence using the nascent ICD-11 PTSD criteria.

Finally, implications for clinical decision making are considered; while concluded to be differentiated the commonality between C-PTSD and D-PTSD criteria and the complications for case attribution should not be ignored. Critics argue that the dissociative components within C-PTSD and common attribution to childhood trauma lead to difficulty in case formulation, some suggesting a more general developmental trauma disorder may be more appropriate (Sar, 2011; van der Kolk et al., 2009). It is however demonstrated through these results and others (see Elklit, Hyland, & Shevlin, 2014; Lanius et al., 2012), that dissociative and complex PTSD symptomologies exist beyond exclusively childhood trauma-exposed populations. There is a need to further examine patterns of symptomatology and traumatic predictors of C-PTSD to gain further information to best understand the disorder. Additionally, the use of discriminant tests may be beneficial for clinical case decision making given the conceptual and indicative diagnostic overlap of PTSD pathologies.

In contrast, it has also been argued that exclusive diagnostic categorisation provides limited clinical utility rather a systematic clinical case formulation and functional analysis approach may be more appropriate (Sturmey, 2009). This approach may be used in conjunction with diagnoses but allows more flexibility in the prescription and treatment of psychological distress (Sturmey, 2009). Indeed, when surveyed clinicians largely agreed on aspects of C-PTSD and most frequently endorsed adoption of a bespoke, sequenced intervention for individual cases (Cloitre et al., 2011). It is hence argued that while C-PTSD may be reliably differentiated in clinical

settings this diagnostic label may have limited utility compared to effective functional analysis.

4.4.2 Limitations

The assertions of this investigation should be considered in light of some notable limitations;

These analyses were conducted using self-report measures of PTSD symptomology which may be argued to be more imprecise in terms of pathology prevalence estimation (D. J. Stein et al., 2014). Indeed, a recent meta-analysis has indicated that self-report measures may significantly overestimate psychiatric morbidity compared to clinical evaluation (Charlson et al., 2019). Likewise, research has shown that retrospective self-reporting of PTSD symptomology is likely to be reflective of the worst day in the period specified, rather than the average experience during that time (Schuler et al., 2019). Future research may hence consider using clinician interviews and evaluations, such as the *International Trauma Interview* currently under development (Karatzias, Cloitre, et al., 2017), and CAPS-5 (Weathers et al., 2018), to examine the inter-rater reliability and concordance of clinical decision making based on application of the ICD and DSM diagnostic criteria.

Secondly, this investigation applies screening measurement of DSM-5 PTSD assessing only the symptoms required to meet caseness for probable diagnosis as no distinct measurement of symptom impairment representative of F (*Impairment*) criteria were present. Previous investigations have shared measurement of impairment using the ITQ items (see Shevlin et al., 2018), however the current study presented these questions separately as part of the ITQ and so were not considered psychometrically valid to assess impairment associated with symptom reporting on the PCL-5. Previous researchers comparing PTSD diagnostics have acknowledged similar limitations in lacking measurement of duration and functional impairment criteria present in the DSM-5 criteria (Hyland et al., 2016). Despite this, the PCL-5 is among the most widely used screening instrument for PTSD and the lack of measurement of functional impairment is a common feature of such studies (Polusny et al., 2016). These results

hence highlight the potential for this to produce inflated estimates of diagnostic estimates while using screening tools for PTSD.

It may also be argued that bespoke measurement of dissociative symptoms would increase measurement validity. Such a measure exists in the Dissociative Subtype PTSD Scale (DSPS; Wolf et al., 2017). This measure specifically examines lifetime and past month presence of symptoms of D-PTSD as specified by the DSM-5. This measure has been psychometrically validated for use with community and clinical veteran populations (see Guetta et al., 2019; Wolf et al., 2017) hence future investigations comparing and contrasting D-PTSD and C-PTSD may consider using this bespoke measure of D-PTSD.

It should likewise be noted that research has called into question the ability for D-PTSD to be exhaustively defined by the presence of depersonalisation and derealisation symptoms. Dorahy and van der Hart (2015) argue that this represents an overly restricted concept and definition of this diagnosis, neglecting to recognise the range of potential dissociative and adjacent symptoms that may be associated with PTSD. Indeed, an investigation of PTSD and numerous dissociative symptoms found patterns of symptom endorsement beyond those codified by DSM-5 D-PTSD to exist (Ross, Baník, Dědová, Mikulášková, & Armour, 2018). As a result future examinations of D-PTSD may benefit from examination of recognised D-PTSD criteria and additional dissociative symptoms to allow for better identification of those that may be part of this group.

Finally, it should be noted that while substantive effort was made to engage heterogeneous groups of veterans through various events and organisations there is possibly an overrepresentation of mental ill-health in the current population. Previous research has indicated in principle that potential participants are more likely to engage with research/surveys related to topics they are highly engaged with, potentially introducing a *self-selection bias* (Khazaal et al., 2014). Indeed, it has previously been shown that previous diagnosis of depression is a significant predictors of engaging with online intervention research for depression (Donkin et al., 2012). It should therefore be acknowledged that participants may be more likely to self-select on the basis of the stated goal of the NIVHWS survey; “Examining the

Health and Wellbeing of the veteran group in NI". Despite this, it is argued that such self-selection should not be considered to invalidate results as respondents may have various motivations for participation and findings remain relevant for the target group, individuals to whom the study topic is applicable (Donkin et al., 2012). Additionally, survey participation was promoted with veterans' support organisations which may have led to overrepresentation of those experiencing significant distress. The results of this study regarding disorder prevalence should be considered in light of these limitations, and care exercised in the generalisation of these results to the wider veteran population.

4.4.3 Conclusions

Despite the aforementioned limitations, this investigation provides a novel examination of diagnostic screening approaches in a sample of NI military veterans. The results herein describe differential prevalence estimates, but a high degree of concordance of DSM-5 and ICD-11 PTSD criteria. In addition, a lower relative rate of agreement between ICD-11 C-PTSD and DSM-5 diagnostic categories was found. C-PTSD criteria therefore appears to identify a unique taxonomy of symptoms that distinguish a sub-group of individuals within the NI veteran population. These results should be considered as tentative support for the *discriminant validity* of the ICD-11 C-PTSD concept.

It is further concluded that the high prevalence of ICD-11 C-PTSD categorisation relative to PTSD diagnosis highlights the relevance of this disorder in the study population and need for further investigation. Given findings of high prevalence of C-PTSD and DSO caseness there is rationale to examine more closely the patterns of response and predictors of such a pathology. The following investigations will hence seek to elucidate patterns of C-PTSD symptom endorsement, and the extent to which traumatic events may predict C-PTSD pathology.

Chapter 5.0;
Latent Profile Analysis of ICD-11 C-PTSD Indicators Among Military Veterans Living in Northern Ireland

5.1 Introduction

As outlined in previously, the recently published ICD-11 has reconceptualised the diagnostic criteria of PTSD, and included a new potential diagnosis of C-PTSD (Maercker, Brewin, Bryant, Cloitre, van Ommeren, et al., 2013; World Health Organisation, 2019b). This has been supported by a number of prior studies examining the factor structure of C-PTSD in relation to its proposed symptom domains. The results of these have supported factor structures consistent with ICD-11 criteria; defining six first order factors representing symptoms, and two second-order factors of PTSD and DSO under which these symptoms are sorted (Hyland, Shevlin, Brewin, et al., 2017). Analysis of factorial models of C-PTSD within NI veteran data presented in the previous study confirmed this factor structure to provide optimal fit to the data (see *Chapter 3*), supporting the application of this construct in the study population.

The current chapter seeks to build on the previous studies by adopting a person-centred approach to symptom reporting. This study aims to investigate the presence of discernible groups of veterans experience C-PTSD pathology. Of previous work similarly adopting a person-centred approach, the majority have specified a qualitatively different pattern of symptoms supporting a new and distinct disorder in a number of clinical and community populations (Karatzias, Shevlin, et al., 2017). Inconsistent and dissenting evidence has however been presented among US military veteran (Wolf et al., 2015) and German treatment-seeking populations (Böttche et al., 2018). Given the death of information concerning C-PTSD symptom profiles in the NI veteran population there is rationale to extend this investigation to include more granular analysis of this concept.

The current study will compliment previous chapters through analyses of symptom patterns within the study population. Such extension to investigations of C-PTSD are founded by previous authors (Knefel, Garvert, Cloitre, & Lueger-Schuster, 2015). This section will introduce the latent variable modelling approach and the extant evidence regarding C-PTSD using these methods, concluding with the specific aims of this study.

5.1.1 Latent Variable Approach

In a similar vein to the factor analytic approach previously adopted in this investigation (see *Chapter 3.1.1; Factor Analytic Approach*) are the latent variable modelling practices of *Latent Class Analysis* (LCA) and *Latent Profile Analysis* (LPA). These techniques similarly attempt to identify latent paradigms from observed data however where factor analysis seeks to group variables into unobserved constructs, LCA and LPA seek to identify and assign people to empirically distinguishable groups of individuals based on patterns of response on a set of variables (K. C. Herman, Ostrander, Walkup, Silva, & March, 2007). These approaches differ in their use of viable level of measurement; LCA is the name given to modeling of binary or discrete data, and LPA where indicator data are continuous (K. C. Herman et al., 2007).

This approach to data analysis typically involves iteratively specifying numbers of potential groupings of response patterns within data, evaluating these on these basis of statistic fit with a dataset and theoretical consistency more generally (Cloitre et al., 2014; Tein, Coxe, & Cham, 2013). These groupings are considered mutually exclusive where cases within the data may be probabilistically assigned to one '*class*' or '*profile*', terms used interchangeably, descriptive of their pattern of response (Tein et al., 2013). It is assumed that an unobserved or latent variable is the determinant of most likely group membership (K. C. Herman et al., 2007). In the application of these methods to the study of patterns of symptomology the latent variable determining group membership is considered to be the presence of a psychopathological condition.

The utility of the latent variable approach lies in producing statistically estimated homogenous groupings indicative of symptom profiles. This constitutes data reduction and allows for more parsimonious understanding of a concept as a function of empirical categories of response within it (Oberski, 2016). In other words, diagnostic categories may be differentiated where an empirical difference in symptom reporting exists (Cloitre et al., 2013; Steuwe, Lanius, & Frewen, 2012). LPA is argued to offer a person-centred approach to understanding psychopathological concepts as this technique specifies a descriptive *profile* of indicator variables based on estimated unobserved variables or concepts rather than rigid criteria adherence

(Bauer & Shanahan, 2007). It further allows for predictors and outcomes to be examined in relation to the profiles specified by the analysis, permitting an end-to-end understanding of psychopathology, an approach to be applied in this and following studies.

These latent variable approaches have been applied previously to evidence distinct post-traumatic psychopathologies, including being applied to the validation of C-PTSD (Cloitre et al., 2014; Elklit et al., 2014). The following sub-section presents an integrative review of the extant evidence regarding the latent variable model of C-PTSD.

5.1.2 Latent Class/Profile Models of C-PTSD

As previously stated the adoption of C-PTSD in the ICD-11 has been supported by consistent evidence in the form of latent variable models of the disorder consistent with the structure and patterns theorised by the WHO Disorders Specifically Associated with Stress working group using the ITQ and its previous versions (Cloitre et al., 2018; Karatzias, Shevlin, et al., 2017). Investigations have examined latent profiles of endorsement on six symptom domains consistent with ICD-11 proposals for PTSD; *Re-experiencing*, *Avoidance*, and *Sense of Threat*, and C-PTSD; *Affect Dysregulation*, *Negative Self-Concept*, and *Disturbed Relationships*. Across studies qualitatively different patterns of symptom endorsement of these domains have been identified differentiating C-PTSD from existing diagnostic categories;

Firstly, Cloitre et al. (2014) provide a latent profile investigations of post-traumatic and Borderline Personality (BPD) symptoms. Researchers have previously indicated that there exists a degree of commonality and comorbid between concepts of PTSD, C-PTSD, and BPD (Ford & Courtois, 2014). The work of Cloitre et al. (2014) found that within a treatment-seeking population of child abuse survivors latent patterns of symptoms were indicative of four distinct sub-groups; Low Symptoms, PTSD, BPD and C-PTSD. In this case the C-PTSD group was differentiated from BPD by high endorsement of PTSD and specific C-PTSD items specified but low endorsement of

specific indicators of BPD such as anger reactivity and fractured self-identity (Cloitre et al., 2014).

A large portion of the literature is however concerned with differentiation of C-PTSD and PTSD diagnoses using LCA. Cloitre et al. (2014) in the aforementioned study further describe the C-PTSD group to be differentiated from the PTSD group by higher endorsement of DSO symptoms. This study hence provided preliminary evidence in support of C-PTSD as a distinct diagnostic entity characterised by high endorsement of those items associated with PTSD and DSO. Elklit et al. (2014) compliment this finding in a Latent Class study of diverse trauma-exposed samples; bereaved parents, sexual assault survivors, and physical assault survivors. This study found that qualitatively different classes of symptom endorsement to be replicated consistently across samples dubbed Low Symptoms, PTSD, and C-PTSD. Once again, the PTSD classes in each sample were defined by high endorsement of indicators of *Re-experiencing*, *Avoidance*, and *Sense of Threat* but comparatively low endorsement of DSO symptoms. The C-PTSD classes consistently exhibited high endorsement of all 12 indicators representing the six symptoms comprising PTSD and DSO (Elklit et al., 2014).

The work of Cloitre et al. (2014) and Elklit et al. (2014) provide useful evidence in support of C-PTSD criteria but are limited by the use of archival data and approximation of C-PTSD pathology through the use of proxy measurement. For this reason, subsequent research has applied purposeful measurement of C-PTSD pathology in the development of the ITQ and its precursor; the ICD Trauma Questionnaire (ICD-TQ). Of those studies employing use of the ITQ the majority have identified two, three or four class solutions to be most applicable specifying patterns associated with Asymptomatic/Resilient, PTSD, C-PTSD, and in some cases a DSO-only groups;

The most widely replicated latent class model is that of a three-class solution, replicating the preliminary evidence supporting C-PTSD (Cloitre et al., 2013, 2014).

Consistent patterns of symptom endorsement indicative of PTSD and C-PTSD groups were similarly found by Murphy, Elklit, Dokkedahl, and Shevlin (2016) in a community sampled in Northern Uganda exposed to civil conflict using an initial version of the ITQ. The results of this study additionally showed the majority of participants (83.4%) to belong to one of the symptomatic groups; 40.3% to C-PTSD and 43.1% to PTSD. The authors attribute this finding to the post-conflict context of the sample arguing the relevance of both conditions for populations exposed to frequent and severe war trauma (S. Murphy et al., 2016).

Comparable findings of three-class solutions of symptoms have similarly been identified among resettled and treatment seeking Syrian refugees using the ICD-TQ (Hyland et al., 2018), and a representative Israeli community sample using the final ITQ (Karatzias, Hyland, Ben-Ezra, et al., 2018). Interestingly, Hyland et al. (2018) noted a higher comaparitve number of cases in the C-PTSD class relative to the PTSD class, while the opposite was found in the Israeli community sample (Karatzias, Hyland, Ben-Ezra, et al., 2018). These results are supportive of the assertion that C-PTSD is of realtively greater concern compared to tradtional PTSD in treatment-seeking and highly traumatised populations (Karatzias, Cloitre, et al., 2017; Karatzias, Hyland, Ben-Ezra, et al., 2018). However, results from studies in clinical populations in Lithuania supporting the same latent variable model have indicated those in the PTSD symptom profile to be more numerous than C-PTSD (Kazlauskas et al., 2018).

Despite this, a 3-class model was replicated among Israili ex-POW's finding PTSD and C-PTSD classes of roughtly equitable size (Zerach, Shevlin, Cloitre, & Solomon, 2019). The authors argue that in the sample of ex-POW's a traumatic relationship between the individual and captors may lead to pervasive DSO difficulties; i.e. negative self-concept and interpersonal distrust (Zerach et al., 2019). Likwise evidence supports that across samples the experience of more prolonged or severe interpersonal trauma leads to greater prevlanece of C-PTSD relative to PTSD (Palic et al., 2016). The relative size of latent symptom profiles may therefore be expected to vary according to a range of sample characteristics and experiences.

To this effect some investigations of latent symptom classes in treatment-seeking sample have supported the application of a two-class solution. The latent variable model supported by these is similar to the previously described three-class model; where two symptomatic classes [PTSD and C-PTSD] are identified in absence of an asymptomatic or 'low symptom' group. This is exampled in the work of Karatzias et al. (2017) which found two profiles of response on the ICD-TQ in a UK treatment-seeking sample consistent with those PTSD and C-PTSD groups described previously (Cloitre et al., 2014; Elklit et al., 2014). This result is replicated in a trauma-exposed adolescent treatment-seeking sample (Sachser, Keller, & Goldbeck, 2017). This once again is argued to support the discriminant validity of C-PTSD owing to the qualitatively different patterns of symptoms observed where the absence of a low symptom group may be expected in clinical populations.

Studies have also supported a divergent, but complimentary, model of latent symptom endorsement in the form of four-class solutions. These studies in accordance with three-class models previously cited identify profiles of response indicative of *PTSD*, *C-PTSD*, and *Asymptomatic* groups (Cloitre et al., 2013) while identifying a fourth class characterised by low endorsement of PTSD indicators and high endorsement of DSO items. This is illustrated by the results of Knefel et al. (2015) in a sample of childhood institutional abuse survivors supporting this four-class model. The authors argued that the finding of a *DSO-only* class is indicative of the presence of general psychiatric morbidities which DSO items may be associated with, such as depressive and anxious disorders (Knefel et al., 2015). This study is however limited by the use of proxy measurement of C-PTSD symptoms hence the results may not readily compare to profiles of validated C-PTSD symptoms.

Despite this, similar findings in support of four-classes including a DSO-only class are reported by Ben-Ezra et al. (2018) using the ITQ items as indicators. There is disparity of note between these results and of investigations similarly conducted sampling an Israeli community population supportive of a three-class model (see Karatzias, Hyland, Ben-Ezra, et al., 2018). The authors however acknowledge the novelty of this finding and note the DSO-only class identified represented a small number of

individuals (*n* = 31, 3.8%) and that this may be indicative of pan-diagnostic symptoms of other psychopathologies (Karatzias, Hyland, Ben-Ezra, et al., 2018).

There are however latent variable model results at odds with those previously discussed which support symptom profiles varied by symptom severity across all indicators rather than quality. This is notably presented in a study of C-PTSD symptoms among a US military veteran and general population samples (Wolf et al., 2015). Wolf et al. (2015) applied LCA methods to both sets of data finding three classes consistent with those previously discussed; described as *PTSD*, *C-PTSD* and *Low Symptom* groups. The researchers however went on to perform factor mixture modelling, incorporating results of latent factors of C-PTSD. The results of this approach instead indicated a four-class solution varied not by symptom qualities but severity across all indicators to best fit the data for both samples. The authors argued that these results undermine the discriminant validity of C-PTSD indicating that those with severe PTSD are more likely to equally experience more severe DSO symptoms rather than a distinct syndrome being present (Wolf et al., 2015).

Two-class solutions have been reported in clinical samples differed by symptom severity. Eidhof et al. (2019) report findings of an LCA of C-PTSD symptoms in a Dutch treatment-seeking population recruited from specialist war and persecution related trauma centres. Similar to other investigations of clinical populations two classes were identified (see Karatzias, Shevlin, et al., 2017) however, these classes were found instead to exhibit homogenous patterns varied by severity. Further to this, Böttche et al. (2018) reported findings of a LPA study of C-PTSD symptoms in a heterogeneous sample recruited from clinical and community populations in Germany. This study concluded a four-class solution to provide best fit to the data, differed however from previous studies as classes were varied by four levels of symptoms severity. The authors however note the two moderate severity profiles to differ somewhat in terms of endorsement pattern; one endorsing moderate PTSD and high DSO, and the other endorsing moderate PTSD symptoms and lower DSO (Böttche et al., 2018).

Taken together these results suggest there may exist a different latent class model of C-PTSD symptoms, one where groups are varied relatively uniformly by severity of symptoms across indicators. It is argued that heterogeneous trauma experience typologies may contribute to the differential patterns of symptom endorsement and ubiquity of DSO symptoms endorsed found by these studies as evidence is derived from diverse trauma-exposed adult samples. It should however be noted that the studies in support of this model (Böttche et al., 2018; Eidhof et al., 2019; Wolf et al., 2015) have used proxy measurement of C-PTSD symptoms as indicators of latent classes. This method may in part explain the divergence in conclusions of these studies as items may more loosely capture C-PTSD criteria.

Finally, it should be noted that across the cited latent class investigations researchers have sought to identify patterns on response using PTSD and DSO items as indicators alone. The implemented ICD-11 criteria for PTSD and C-PTSD however specify that symptom related functional impairment is central to diagnosis (Cloitre et al., 2018). The neglect to incorporate this domain of post-traumatic psychopathology into latent class models is argued to limit understanding of the ICD-11 diagnostic constructs.

5.1.3 Research Aims

The overarching aim of this study is to investigate the presence of latent patterns of C-PTSD symptom endorsement among NI military veterans using the ITQ. This is accomplished through application of LPA techniques to investigate if multiple symptom profiles are evidenced representative of traditional PTSD and C-PTSD as described by ICD-11 criteria (Cloitre et al., 2018).

To date few investigations has adopted such an approach with military veteran data. Within this limited pool of evidence contrasting results have been reported relative to other trauma exposed populations (see Wolf et al., 2015). There is therefore a rationale to further investigate profiles of post-traumatic symptoms in the current study population of military veterans, and as such this investigation offers a novel contribution to the universal validation of C-PTSD.

Additionally, the lack of investigation regarding functional impairment as indicators in prior latent symptom profiles of C-PTSD is addressed by this investigation. This study seeks to identify symptomatic groups using LPA of response on the 18-item ITQ indicative of the experience of C-PTSD among NI military veterans.

5.2 Methodology

5.2.1 Measures

Sociodemographic Information was measured using bespoke items administered as part of the NIVHWS survey. For more information on the items and measures included please consult *Chapter 2.3; Measures and Survey Structure*.

The *International Trauma Questionnaire* (ITQ; Cloitre et al., 2018) was used to assess C-PTSD as specified by the ICD-11 (6B41; World Health Organization, 2018). The ITQ consists of 18 items; six measuring symptoms of PTSD (Re-experiencing, Avoidance, and Sense of Threat), six measuring Disturbances in Self-Organisation (DSO) characteristic of C-PTSD (Interpersonal Difficulties, Difficulties with Affect Regulation, and Negative Self-Concept), and six indicators of functional impairment associated with PTSD for DSO symptoms.

A development version of the ITQ (Version 1.5.2; (Cloitre et al., 2015) was administered to participants as this was the established measure at the time of data collection. Since original data collection the finalised version of the ITQ has been published (see Cloitre et al., 2018) and hence these items are used in analyses. The relevant items on this measure used as indicators are detailed in *Appendix 2.1*. "Each subscale of this measure was found to have favourable reliability in this study sample; Re-experiencing (α = .932), Avoidance (α = .942), Sense of Threat (α = .905), Affect Dysregulation (α = .880), Negative Self-Concept α = .969), and Disturbances in Relationships Dysregulation (α = .901).

5.2.2 Procedure

A full description of data collection and cleaning procedures may be found in *Chapter 2; Main Survey Phase* and *Dataset Administration.* A total of *N* = 584 participants were found to provide consent and begin the survey. Cases with an excess of 20% missing values on relevant study variables were excluded from further analyses (*n* = 227). Those cases included were compared to those excluded due to excessive missingness on key study variables. These variables were found to be non-normally distributed and therefore the Mann-Whiney U test was used to compare groups. Results showed

that groups did not differ significantly on any primary study variables (see Appendix 3.2 for full details). Data were examined for patterns of missingness using Little's MCAR test which showed data were missing completely at random; $\chi 2(130, n = 584) = 151.016$, $p = .100$. Assumptions were met to use EM imputation (see *Chapter 3.2.2*), an approach selected as this allowed for estimation of item level data yielding an imputed complete dataset used for estimation of the latent profile models in the current analysis ($n = 357$).

The imputed dataset was then prepared for use with Mplus 7.3.1 (Muthén & Muthén, 2015), conversion of file format and removal of variable labels. A number of class/profile solutions were iteratively estimated and examined for goodness of fit for the data ascending from a one-class solution to a six-class solution. The analytic procedures are detailed substantively in a later sub-section (see *Chapter 4.2.4; Data Analytic Plan*).

5.2.3 Participants

Relevant participant demographic information for this sub-sample was captured from Section A of the survey. The following demographics correspond to the sample used in the current study.

Table 5.1; Chapter Five Participant Demographic Information, N = 357

Variable	***n* (%)**
Gender/Sex	
Male	319 (89.4)
Female	38 (10.6)
Marital Status	
Single/Widowed/Separated	94 (26.3)
Married/In Relationship	263 (73.7)
Educational Attainment	
No Qualifications	59 (16.5)
GCSE*	98 (27.5)
A-level*	47 (13.2)
Higher Education Diploma*	62 (17.4)
Bachelors or Post-Graduate Degree*	90 (25.2)
Refused/Missing	1 (0.3)

* *Or equivalent qualification*

Variable	*n* (%)
Employment	
Unemployed	12 (3.4)
Self Employed	21 (6.0)
Employed (Full-time)	141 (40.2)
Employed (Part-time)	22 (6.3)
Student/Full-time Education	7 (2.0)
Unable to Work	27 (7.7)
Retired	72 (20.5)
Medically Retired	42 (12.0)
Full-time Carer	6 (1.7)
Refused/Missing	1 (0.3)
Branch	
Royal Navy	17 (4.8)
Royal Marines	7 (2.0)
Army	309 (86.6)
Royal Air Force	24 (6.7)
Rank	
Officer	62 (17.4)
Non-Commissioned Officer	198 (55.5)
Other Ranks	97 (27.2)
Time in Regular Service	
Never	30 (8.4)
Less than One Year	2 (0.6)
Up to 10 years	123 (34.5)
11-20 Years	104 (29.1)
21+ Years	95 (26.6)
Refused/Missing	3 (0.8)
Time in Reserve Service	
Never	153 (42.9)
Less than One Year	14 (3.9)
Up to 10 years	121 (33.9)
11-20 Years	27 (7.6)
21+ Years	24 (6.7)
Refused/Missing	18 (5.0)
Current reservist	
Yes	34 (9.5)
No	323 (90.5)
Service in Northern Ireland	
Yes	176 (49.3)
No	180 (50.4)
Refused/Missing	1 (0.3)

The final dataset intended for use following missing data procedure described in the previous section yielded a dataset of *N* = 357. As noted by previous studies this sub-sample was reminiscent of the cases in the overall dataset; predominately male,

married, and had previously served in the Army. The mean age of respondents featured in these analyses was 54.79 (Range = 27-86, *SD* = 11.35).

5.2.4 Data Analytic Plan

The present investigation utilised LPA to examine C-PTSD indicators; measured by the 18-item ITQ (Cloitre et al., 2018). The proposed domains measured within the ITQ are three PTSD domains; *Re*, *Av*, and *Th*, and associated *Functional Impairment*. Similarly, three DSO domains are present; *AD*, *NSC*, and *DR*, as well as *Functional Impairment* associated with these. Many previous investigations have used these symptom domains as categorical indicators for analysis of latent profiles or classes. This may be argued to result in a loss of information relative to examining each item as continuous latent profile indicators. This is potentially to the detriment of analyses as more subtle patterns of response may be obscured through collation of responses. The use of item-level indicators and continuous data in the current study hence allowed for more granular understanding of C-PTSD symptom profiles (Jongedijk, van der Aa, Haagen, Boelen, & Kleber, 2019).

All models were tested using 10 optimisations of 100 random starts to prevent supporting a local maxima. In accordance with established practice; models were evaluated and compared using an omnibus of fit indices; *Akaike Information Criterion, Bayesian Information Criterion*, *Sample-Size Adjusted BIC* and the *Lo–Mendell–Rubin Likelihood Ratio Test* (see Kline, 2015).

5.3 Results

5.3.1 Interpretation of Fit Indices

The *Akaike Information Criterion* (AIC) and *Bayesian Information Criterion* (BIC) are commonly applied model fit statistics which enumerate the likelihood that the model specified accurately fits the data (Tein et al., 2013). The *Sample-Size Adjusted BIC* (SSABIC) similarly specifies if the model accurately represents the data while additionally factoring the number of cases used for calculation (Tein et al., 2013). For each of these fit indices a lower resultant value is generally held to represent a better model fit, with the model possessing the lowest IC values supported as the best fit for that data (Nylund, Asparouhov, & Muthén, 2007).

The *Lo–Mendell–Rubin Likelihood Ratio Test* (LMR-LRT) examines whether or not a model performs significantly better than a model with one fewer classes (Nylund et al., 2007). Where the *p* value for the LMR is found to the statistically significant [$p < .050$] this suggest the model performs better than the previous and as such the number of classes should be increased until the LMR returns a non-significant result (Cloitre et al., 2013; Nylund et al., 2007). Additional classes should also be tests as the further increase of classes may return another significant result (Nylund et al., 2007). This statistic is considered a robust indictor of optimal model fit and performs well with analyses in conjunction with additional indicators (Nylund et al., 2007). The *Entropy* value may range from 0 to 1 with greater values indicative of more favourable model fit (Gabriel, Daniels, Diefendorff, & Greguras, 2015). These fit indices are those most commonly reported and analysed in studies employing latent variable modelling (R. B. Kline, 2015).

There are no established cut-off values for support of any solution when conducting LPA, rather a decision should be made according to the aforementioned criteria for each fit statistic (Gabriel et al., 2015) and interpretability of the resulting classes (L. M. Collins & Lanza, 2009). Tein et al. (2013) argue that the decision to support a model solution should not be based on a single information criterion or fit statistic, but a combination of several to make the most well-informed choice based on data. This framework guides analysis of the data herein.

5.3.2 Model Fit and Selection

As is considered best practice in latent profile modelling, the number of class solutions were progressively increased and test for goodness of fit with each iteration until indices dictate that the addition of profiles does not fit the data (Cloitre et al., 2013; Lanza & Rhoades, 2013). A total of six class/profile solutions were examined for fit with the data. The fit indices for each iteration of analyses are shown in *Table 5.2* below.

Table 5.2; Model Fit Indices for Latent Profile Analysis Models of the International Trauma Questionnaire

	Loglikelihood	# parameters	AIC	BIC	SSABIC	LMR-LRT (*p*)	Entropy
1	-11545.495	36	23162.990	23302.588	23188.379	-	-
2	-8704.572	55	17519.144	17732.419	17557.934	5631.420 (.000)	.992
3	**-8037.680**	**74**	**16223.360**	**16510.312**	**16275.549**	**1321.947 (.000)**	**.981**
4	-7742.300	93	15670.599	16031.229	15736.189	585.518 (.419)	.974
5	-7557.608	112	15339.216	15773.522	15418.206	366.105 (.185)	.979
6	-7458.643	131	15179.285	15687.268	15271.675	196.174 (.634)	.973

Note: AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, SSABIC = Sample-Size Adjusted BIC, LMR-LRT = Lo–Mendell–Rubin Likelihood Ratio Test.
** Supported model highlighted in **bold**.*

The model number in Table 5.2 above denotes the number of profiles attempted to fit the data. In each model iteration an increase in number of classes was found to improve the AIC, BIC and SSABIC indices as shown by their reduced value with each additional class. These results would suggest that a greater number of classes, up to six would provide the best fit for these data.

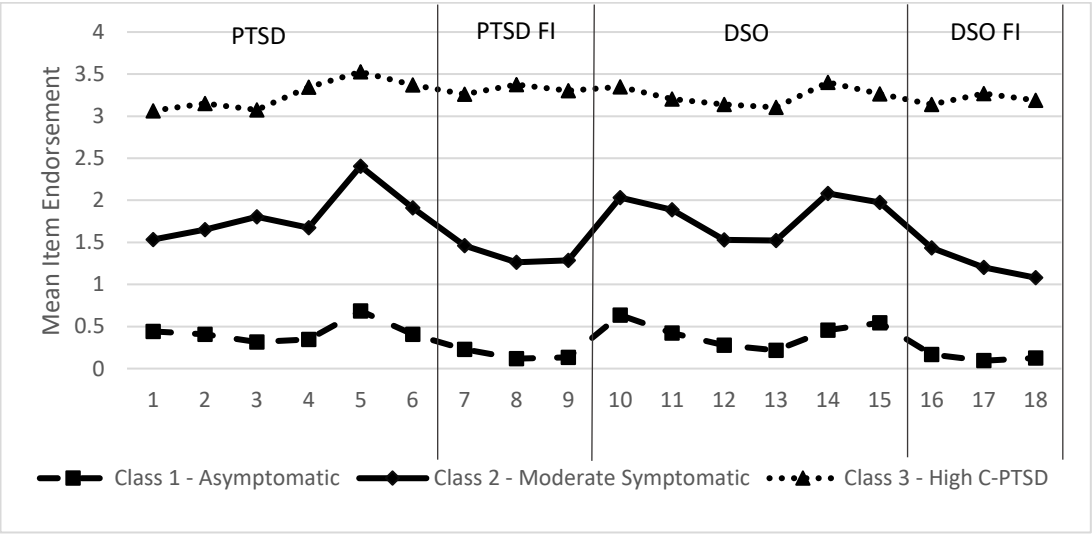
The LMR-LRT and Entropy results however indicated that the addition of classes beyond three did not significantly improve fit. Moreover, the groups identified by the four, five, and six-class model were examined and considered not meaningfully

distinct. Based on interpretation of summation of the fit indices as previously described and by the parsimonious interpretability of classes (L. M. Collins & Lanza, 2009), a three-class solution was selected as the most optimal fit for these data.

5.3.3 Latent Profiles of C-PTSD Symptomology

The next stage of analysis is to assign meaning to each of the classes identified by way of data interpretation. This was done through inspection of mean item endorsements per group and by generating a plot representative of the average item endorsement per group (see *Figure 5.1; Latent Profile Plot - Mean Item Responses for 18 Item International Trauma Questionnaire*). Based on these observations and extrapolation of previous research (see Hyland et al, 2018) the classes were labelled; *Asymptomatic*, *Moderate Symptomatic*, and *High C-PTSD*.

Figure 5.1; Latent Profile Plot – Latent Class Mean Item Responses on the International Trauma Questionnaire



PTSD	C1	C2	C3
1. Upsetting Dreams	0.44	1.53	3.07
2. Powerful Images	0.41	1.65	3.15
3. Internal Avoidance	0.32	1.80	3.08
4. External Avoidance	0.35	1.68	3.35
5. Hyperarousal	0.69	2.41	3.53
6. Exaggerated Startle	0.41	1.91	3.37
7. Impaired Relationships	0.23	1.46	3.26
8. Impaired Work	0.12	1.27	3.38
9. Impaired Life Activities	0.13	1.29	3.30

DSO			
10. Reactive	0.63	2.03	3.35
11. Emotionally numb	0.42	1.89	3.20
12. Feel like a Failure	0.28	1.53	3.14
13. Feel Worthless	0.22	1.52	3.11
14. Feel distant	0.46	2.08	3.40
15. Not emotionally close	0.54	1.98	3.26
16. Impaired Relationships	0.17	1.43	3.14
17. Impaired Work	0.09	1.20	3.27
18. Impaired Life Activities	0.13	1.08	3.19

Note: Item number correspond to X axis.
PTSD = Post-Traumatic Stress Disorder, DSO = Disturbance in Self Organisation, FI = Functional Impairment

The first and largest class, Class One; *Asymptomatic*, represented 47.6% of the total sample and was characterised by low endorsement of all PTSD and DSO symptomology. This group exhibited a similar, but more subdued pattern of response to the symptomatic groups with slightly increased endorsement of hyperarousal symptoms, and minor increases in reporting of Affect Dysregulations and Disturbed relationships.

Class Two; *Moderate Symptomatic*, represented 25.8% of the total sample and is characterised by moderate endorsement of PTSD items, Affect Dysregulation, and Disturbed Relationships. This class exhibited reduced endorsement of Functional Impairment items for both PTSD and DSO compared to Class 3. NSC endorsement was noted to also be lower relative to other symptoms within this group while endorsement of the Reactivity item was notably higher than other symptoms.

Class Three; *High C-PTSD*, defined 26.6% of the current sample and is characterised by high endorsement of PTSD symptoms (Hyperarousal, Avoidance, and Re-experiencing) as well as elevated rates of endorsement of all DSO domains. This group was differentiated by high endorsement of functional impairment associated with both PTSD and DSO symptoms relative to the *Moderate Symptomatic* class.

5.3.4 Diagnostic Categorisation and Latent Class Membership

Most likely class membership was cross-tabulated with assigned ICD-11/ITQ diagnosis computed in the same way previously described within this investigation (see *Chapter 4.2.1*). *Table 5.3* below describes the proportion of diagnostic cases relative to class membership;

Table 5.3; Diagnostic Category Allocation Based on ITQ Criteria for Three-Class Solution

	C1; Asymptomatic *n* = 170 (%)	C2; Moderate Symptomatic *n* = 92 (%)	C3; High C-PTSD *n* = 95 (%)
No Diagnosis	170 (100.0)	67 (70.5)	6 (6.5)
PTSD	-	15 (15.8)	9 (9.8)
C-PTSD	-	10 (10.5)	80 (87.0)

Note: Diagnosis figures calculated according to ICD-11 criteria for PTSD [6B40] and C-PTSD [6B41] (WHO, 2019c)*. Computation of diagnostic category also described substantively in Chapter 4.2.1; Measures.*

Inspection of frequencies and proportions of class membership meeting diagnostic criteria showed the majority (87.0%) of *Class 3* members met criteria for C-PTSD diagnosis. *Class 2* members were likely to be assigned 'No Diagnosis' according to ICD-11 criteria but a minority were assigned to PTSD or C-PTSD categories, 15.8% and 10.5% respectively. In the current sample prevalence estimates using the ITQ showed *n* = 243 (68.1%) of this sub-sample were categorised as 'No Diagnosis', *n* = 24 (6.7%) receiving a probable diagnosis of PTSD, and *n* = 90 (25.2%) receiving a probable diagnosis of C-PTSD. The majority of those receiving no probable diagnosis were likely to belong to *Class 1* (70.0%), and the majority C-PTSD cases identified (88.9%) were allocated to *Class 3*. While the majority of PTSD cases (62.5%) were allocated to Class 2 it is noted that that a minority were allocated to *Class 3* (37.5%) in this latent profile model.

Post-hoc tests of association were additionally conducted to examine effects between assigned class membership and diagnosis according to ITQ criteria. Results of a Chi-squared test of independence showed that assigned diagnostic category and class membership were significantly associated with one and other ($X^2(4) = 285.596$, $p < .001$).

5.4 Discussion

This study aimed to distinguish C-PTSD as a unique presentation of symptomology differentiated from PTSD diagnostic criteria using LPA. While no model was unambiguously found to provide the best fit across all indices the sum of results supported a three-class solution for these data comprised of; an *Asymptomatic* group, a *Moderate Symptomatic* group, and a *High C-PTSD* group. These results support that C-PTSD pathology exists within the study population and that this syndrome may be distinguished from more moderate post-traumatic pathology. However, in contrast to many previous studies this study failed to identify a latent class of individuals endorsing PTSD symptoms exclusively, in absence of DSO symptoms (cf. Cloitre et al., 2013; Hyland et al., 2018; Kazlauskas, Gegieckaite, Hyland, Zelviene, & Cloitre, 2018). Inspection of class member's likely diagnostic status indicated that the majority of C-PTSD cases were associated with the *High C-PTSD Class*, and the majority of PTSD cases with the *Moderate Symptomatic Class*.

The results of this study are at odds with literature concerning latent profiles of C-PTSD symptoms to find distinct patterns representing PTSD and C-PTSD (c.f. Karatzias, Hyland, Ben-Ezra, et al., 2018; Kazlauskas et al., 2018). These results are similar to the contrarian body of work previously cited indicating C-PTSD symptom profiles to be differentiated by symptom severity (see Böttche et al., 2018; Eidhof et al., 2019; Wolf et al., 2015).

Wolf et al. (2015) provided one of the most dissenting studies of C-PTSD latent profiles; concluding results of a FMM to support four classes varied by severity. The authors argue this finding to undermine the distinction between PTSD and C-PTSD proposed, and that DSO symptoms may be simply associated with PTSD more generally (Wolf et al., 2015). Indeed, prior research has shown affective dysregulation to moderate the expression of DSM-5 PTSD symptom clusters (Seligowski, Rogers, & Orcutt, 2016). It has thus been suggested that the relationship between PTSD and DSO symptoms is bidirectional and therefore some inter-diagnostic influence is to be expected where by the presence of DSO prior to trauma and PTSD development

contribute to more severe symptomology, and the finding of C-PTSD ubiquity (Eidhof et al., 2019). As such, the observation of patterns of C-PTSD symptoms varied by severity may indicate more general psychopathological distress and not a unique disorder (Wolf et al., 2015).

Wolf and colleagues (2015) however acknowledged that the use of a homogenous sample exposed to a variety of traumatic life events may have biased these result. Indeed, the military veteran samples used by Wolf et al. (2015) and in the current study exhibited markedly high endorsement of DSO symptoms, and were often endorsed more frequently than PTSD symptoms in the current sample (see *Chapter 4.3.1; Prevalence*). Eidhof et al. (2019) faced with similar results to those reported here, absent a unique PTSD profile, speculate that contextual factors such as emotional neglect present in the sample used may lead to near ubiquity of C-PTSD pathology relative to traditional PTSD. It is therefore similarly suggested that given the common finding of high DSO pathology among military veterans (see Wolf et al., 2015), there may exist some population or contextual factors amongst this group may contribute to DSO symptoms and C-PTSD.

Conversely, Zerach et al. (2019) in a study of Israeli veteran ex-POWs found a three-class model differentiating PTSD and C-PTSD to be supported. It may be argued that the experience of this group, i.e. interpersonal trauma through captivity, may explain the differentiation of PTSD and C-PTSD classes. The authors of this study argue that forceful imprisonment and efforts to 'break' captives provide a unique opportunity for distorted attachments, cognitions, and affect heightening the risk for C-PTSD (Zerach et al., 2019). Experiences such as this may be argued to be conceptually related to those initially proposed as Complex Trauma and as risk factors for C-PTSD (J. L. Herman, 1992). It is therefore possible unique and non-traditional experiences among veterans may be associated with risk for C-PTSD.

Böttche et al. (2018) provided comparable results to the current study and to that of Wolf et al. (2015) in supporting a four-class solution varied by severity. The conclusions of Böttche et al. (2018) however differed from that of Wolf et al. (2015) instead tentatively supporting the implementation of PTSD and C-PTSD concepts. The moderate symptomatic classes identified by Böttche et al. (2018) did vary

meaningfully in endorsement of PTSD and DSO symptoms, showing patterns consistent with that proposed by the ICD-11 (Hyland, Shevlin, Brewin, et al., 2017). In the current study close inspection of symptom endorsement showed the *Moderate Symptomatic* and *C-PTSD* classes to exhibit some qualitative differences. These differences are novel however and unique to the current investigation;

Firstly, in both the *Moderate Symptomatic* and *High C-PTSD* profiles Hyperarousal endorsement was high. This was of particular note in the *Moderate Symptomatic* group as endorsement was elevated relative to all other symptoms. It is notable that Hyperarousal was elevated while the second *Th* symptom, Exaggerated Startle, was broadly comparable to other symptom endorsements in this class. This may suggest that individuals in this population chose to remain alert to potential threats due to perceived necessity of this trait. This finding and evaluation is reminiscent of prior qualitative work conducted with NI military veterans. NI military veterans have reported feeling at risk of attack due to their former military status, and remained acutely tuned to potential threats in their environment (Armour, Walker, Waterhouse-Bradley, Hall, & Ross, 2017). The same report showed that veterans reported feeling of isolation post-transition from both a loss of military structure and a reluctance to trust others due to security concerns (Armour et al., 2017). This may be argued to contribute to both Hyperarousal and interpersonal difficulties. These results suggest that there may exist unique contextual factors associated with the NI veteran population that influence the risk for DSO symptoms and C-PTSD.

Secondly noted is the disparity in NSC endorsement between the *Moderate Symptomatic* and *C-PTSD* classes. NSC mean endorsement was noted to be lower than other DSO domains in the *Moderate Symptomatic* class. Previous investigations have indicated that negative beliefs about one's self and the world both pre- and post-trauma are associated with PTSD pathology (Ali, Dunmore, Clark, & Ehlers, 2002). In addition to this, Sense of Coherence; individual beliefs about the structure of the world and ability to navigate within it, has been shown to mediate the severity of PTSD symptoms (Kaźmierczak, Strelau, & Zawadzki, 2016). Given this evidence it is argued that the NSC may act as a 'gateway' to the *C-PTSD* profile whereby the

presence of NSC elevates the severity of other C-PTSD symptoms. This symptoms domain may therefore be beneficial to target in the assessment and treatment of C-PTSD and those with severe PTSD.

Finally, symptom-related functional impairment for both PTSD and DSO symptoms was found to be comparatively lower for members of the *Moderate Symptomatic* group relative to the consistent high endorsement among *C-PTSD* class members. This finding compliments the conclusions of Hyland et al. (2018); that functional impairment was the only predictor under investigation significantly associated with PTSD and C-PTSD class membership. While associated with both symptomatic classes, higher functional impairment was more indicative of C-PTSD class membership than PTSD membership. The findings of Hyland et al. (2018) coupled with the differential patterns of *Moderate Symptomatic* and *C-PTSD* classes in the current study suggests that functional impairment may be a valuable indicator to differentiate symptomatic groups. Indeed, as a central criteria for diagnosis and being associated with increased severity of C-PTSD pathology (Cloitre et al., 2018) functional impairment may be applied more frequently in investigations to examine its utility to differentiate post-traumatic symptom groups.

It should be noted that ICD diagnostic criteria specify that PTSD and C-PTSD diagnosis are mutually exclusive (WHO, 2019c; Cloitre et al., 2018). There is hence value in this type of investigation as researchers and clinician strive to classify individuals into this new diagnostic category as effectively as possible. The results of the current investigation demonstrate C-PTSD symptom endorsement to vary at moderate and high levels of severity rather than differentiating groups according to symptom typology/pattern. This may be argued to undermine the assertion of ICD-11 criteria distinguishing these disorders. It was however found that according to ICD-11 diagnostic criteria the majority of PTSD cases were assigned to the *Moderate Symptomatic* class and C-PTSD cases to the *C-PTSD* class. This result is comparable to the findings of previous latent profile studies demonstrating some difference in diagnostic classification within symptomatic classes (Kazlauskas et al., 2018; Perkonigg et al., 2016). This indicates that currently ICD-11 criteria currently do

largely identify consistent groups experiencing psychopathological distress however the latent pattern of symptoms may differ from that previously supposed (Kazlauskas et al., 2018).

It is also noted that within the symptomatic classes a majority of cases in the *Moderate Symptomatic* class and a minority in the *C-PTSD* class were not assigned a diagnosis under ICD-11 criteria. This may be argued to indicate the potential for the diagnostic algorithm to overlook potentially genuine cases and prompt criticism of the diagnostic model (Hansen et al., 2015). It is therefore suggested that the utility and efficacy of the ICD-11 diagnostic criteria for PTSD be evaluated in conjunction with clinician assessment across populations and revised where necessary.

Conversely of note is the concept of subthreshold disorders. There is a range of extant literature concerning subthreshold PTSD; a condition where a number of PTSD symptoms are experienced and significant impairment is reported however criteria are not met for full diagnosis either through subthreshold distress or non-endorsement of some symptoms (Mylle & Maes, 2004). This concept of partial or subthreshold syndromes may be extended to C-PTSD. The results of this study highlight the potential for groups reporting moderate experiences of DSO, but perhaps not all three of sufficient severity to qualify for diagnosis. In such cases these individuals may be classified as having PTSD, neglecting to recognise the difficulties experienced through affective dysregulation and interpersonal disturbances. 'Partial' PTSD presentations have been shown to remain clinically significant and require treatment strategies to curb exacerbation of distress (Mylle & Maes, 2004). A similar approach may be argued to address issues rising from subthreshold PTSD/C-PTSD as shown in the *Moderate Symptomatic* class. Alternatively, these DSO symptoms may remain a non-issue in presentation and not increase in severity or impairment. As these data are drawn from a cross sectional sample conclusions regarding this assertion cannot be made with confidence. Future research should seek to use a longitudinal cohort approach to examine the progression and development of C-PTSD symptomology to better understand the relationship between DSO and PTSD symptoms.

These considerations in conjunction with the finding that the majority of C-PTSD cases were assigned *Class 3* membership and the PTSD cases to *Class 2* membership suggests that ICD-11 criteria possess utility in the NI military veteran population. The currently proposed ICD-11 PTSD diagnostic algorithm appears to identify empirically different groups. Similar to previous authors it is concluded that disparity in latent profiles does not inherently undermine the C-PTSD and PTSD differentiation, but rather should leave researchers to consider the implications of criteria in different populations (Böttche et al., 2018; Perkonigg et al., 2016). Given the relative ubiquity of probable C-PTSD diagnosis previously identified (see *Chapter 4.3.1; Prevalence*) and the patterns of symptoms presented in this chapter it is possible that within this population C-PTSD diagnosis may be more relevant.

The contrarian results of this study in conjunction with that of others presented in veteran and mixed trauma-exposed populations (Böttche et al., 2018; Eidhof et al., 2019; Wolf et al., 2015) indeed suggest that C-PTSD symptomology may vary as a function of traumatic experience and context. Where environments are *traumagenic*, i.e. environmental and interpersonal dynamics which result in traumatic stress and alteration of cognitions and attitudes (Finkelhor & Browne, 1985), may lend themselves more greatly in some capacity to the development of DSO symptoms C-PTSD may be a more relevant pathological outcomes compared to traditional PTSD. For this reason, further investigation of the effects of traumatic exposure and population characteristics on C-PTSD pathology is warranted.

5.4.1 Implications

The substantiation of an alternate model of latent symptom profiles presented by both Wolf et al. (2015) and the current study suggests that the C-PTSD pathology may be different among military veterans compared to other populations. These findings together imply that DSO symptoms present frequently with PTSD in this group and consideration to this should be given in clinical evaluation of veterans and service personnel. Due to the variety of potential post-traumatic reactions it is vital that

practitioners consider the effects of military experiences on the development and expression of symptomology and recognise the potential for novel disorders such as C-PTSD to arise in veteran populations (Forbes et al., 2019).

Additionally, It has previously been reported that self-stigmatising beliefs act a salient barrier to help-seeking for military veterans in NI (Armour et al., 2017). The perceived stigmatisation of the veteran group may be argued to contribute to NSC as veterans internalise negative views of the military veteran group and believe that these extend to themselves. It is possible that those who do internalise such beliefs become the most impaired and distressed or that a higher degree of PTSD symptomology makes it more likely this view will be adopted. Hence those who experience the most severe PTSD symptoms are most vulnerable to developing C-PTSD as environmental factors may foster DSO. There may therefore be different aetiological mechanisms of C-PTSD development. The results of the current investigation may be interpreted as indicative of an alternative external mechanism for DSO development however additional research would be required to substantiate this.

Further to this, Prior research has highlighted to relevance of targeting self-compassion in the treatment of C-PTSD to tackle NSC and emotional hypoactivation (Karatzias, Hyland, Bradley, et al., 2018). These results herein concerning the prevalence of NSC among the C-PTSD group paired with prior findings of prevalent self-stigmatisation among this population (Armour et al., 2017) likewise suggest that self-compassion may be a clinically relevant domain to target for this group in addressing C-PTSD. These results therefore provide foundational evidence for the pursuit of clinical intervention strategies for C-PTSD within the veteran population.

These findings also highlight the potential role of symptom-related functional impairment in differentiation of C-PTSD. It is possible that many individuals present with moderate, i.e. approximate threshold, indication of PTSD and DSO symptomology but these may be considered by the subject to not interfere with daily life. Current C-PTSD criteria stipulate each symptoms plus functional impairment related to them must be endorsed (Cloitre et al., 2018). It is possible that currently diagnoses inadvertently identify ‘moderate’ and ‘severe’ post-traumatic pathologies as PTSD and C-PTSD respectively in some applications as demonstrated herein. These

findings highlight the need for further examination regarding the application of ICD-11 PTSD criteria in novel populations.

5.4.2 Limitations

The results and discussions presented herein must however be considered in light of some notable study limitations;

Firstly, the LPA method applied in this study is limited in its largely categorical concept of psychopathology meaning individuals are assigned groups disallowing more nuance view of symptom expression and interaction (Muthén, 2006). Such approaches are constrained and lead researcher to support perhaps overly simplistic models of psychological ill-health. Indeed, it should also be recognised that the results of LPA identify homogenous patterns within grouped data and therefore the conclusions about 'types of individual' is cautioned (Lanza & Rhoades, 2013). Further still it should be acknowledged that the model choice made in this investigation was guided by parsimony and a sub-set of fit indices (L. M. Collins & Lanza, 2009). The results of this study should therefore be considered in light of the fact there is not an unambiguous 'best fitting' model.

Further to this, It should be noted however that when estimating LPA models there is the potential for the introduction of bias as models are loosely specified by the analyst and hence best practice dictates that viable alternative explanations for results be considered (Wolf et al., 2015). Indeed, the results herein support this as one of two studies investigating latent C-PTSD profiles among military veterans (see Wolf et al., 2015), with both presenting support of an alternate model to that of other populations. The findings of this study may therefore be complemented and validated through application of factor mixture modelling techniques (see Muthén, 2006) and clinician evaluations within this population.

Secondly, this study used finite indicators of posttraumatic psychopathology; the 18 items presented within the ITQ (Cloitre et al., 2018). A strength of this study does lay in use of ICD-11 proposed criteria for C-PTSD, uniquely investigating patterns of functional impairment endorsement. Despite this it should be considered that

additional indicators beyond those herein may serve to differentiate classes of post-traumatic symptoms. Prior research has used indicators of dissociation to substantiate the dissociative subtype specified by the DSM-5 (Armour, Karstoft, & Richardson, 2014; Wolf et al., 2012). Likewise researchers have investigated symptoms of psychosis as indicators in conjunction with C-PTSD and found patterns of post-traumatic symptomology confirming an associated between these constructs (Frost, Louison Vang, Karatzias, Hyland, & Shevlin, 2019). There are therefore alternate conceptualisations of post-traumatic pathology with additional potential indicators that may be proposed. Future research may attempt further validation of ICD-11 PTSD diagnostics through latent variable models incorporating indicators alternate and comorbid diagnoses.

Thirdly, this study examined only the diagnostic category assigned to cases using ITQ scoring in association with class membership. Extant evidence suggests that demographic factors such as age, sex, and relationships status may be predictive of C-PTSD pathology (Hyland et al., 2017; Perkonigg et al., 2016). Additionally, there is considerable theoretical and empirical evidence to suggest that trauma characteristics may be predictive of C-PTSD and traditional PTSD outcomes. Specifically, researchers have theorised and evidenced the effects of *Complex Trauma* on subsequent psychopathology (Cloitre et al., 2009; J. L. Herman, 1992). Consequently, it may be argued that these classes may be better understood through examination of demographic variables and traumatic events that predict class membership.

Finally, the finding of high endorsement of DSO items is critically examined. The presentation of DSO items in close proximity to PTSD items as is present as part of the ITQ (Cloitre et al., 2018) may produce an *Order-Effect Bias*. This posits that association between items presented closely in surveys may bias participant responses (Perreault, Jr., 1975). This may explain in part the finding of symptoms to vary in similar patterns of endorsement, i.e. where participants highly endorse PTSD items they may be more likely to similarly endorse subsequent DSO items. Conversely prior evidence with US military veterans has reported similarly high endorsement of DSO indicators (Wolf et al., 2015). This finding may therefore be a function of

population characteristics. Future research may consider comparison of response bias effects on the presentation of PTSD and DSO items in sequence and separately.

5.4.3 Conclusions

Despite the discussed limitations this investigation provides and initial enquiry into the expression of C-PTSD symptoms among military veterans living in NI. The latent variable approach applied herein compliments the previous studies in this investigation supplying evidence in a person-centred perspective in addition to the variable-centred approach offered by factor analytic and diagnostic categorisation presented in previous chapters (Bauer & Shanahan, 2007).

The results and conclusions presented in this chapter substantiate the emergent evidence of latent symptom classes of C-PTSD finding classes to vary by symptom severity rather than typology. The novel findings reported stimulate further discussion of the alternate manifestation of C-PTSD psychopathology and prompt consideration of the influence of environmental factors and preceding trauma(s) on consequent symptomology. Researchers have asserted that C-PTSD may be predicted more readily by particular traumatic experiences namely; childhood and cumulative trauma indicative of so called *Complex Trauma* (Cloitre et al., 2013; J. L. Herman, 1992). The conclusions and assertions of this investigation warrant further analysis, examining the predictive role of environmental stressors on the development of C-PTSD latent class membership.

The subsequent study and chapter builds on the findings presented herein and address some of the acknowledged gaps; examining the role of different traumatic stressors in the development of C-PTSD symptomology grounded in Complex Trauma theory and a sociocultural perspective of trauma.

Chapter 6.0;

Complex Trauma Predictors of ICD-11 C-PTSD Profiles Among Military Veterans Living in Northern Ireland

6.1 Introduction

The studies within this thesis thus far have examined the nosology and pathology of C-PTSD, tentatively validating current proposals of this disorder. There is however an additional facet of this disorder that must be considered in its validation; its causes or aetiology.

PTSD is unique among psychiatric conditions in that diagnosis contains explicit acknowledgement of the aetiology of symptoms; an index traumatic event from which distress stems (J. Y. Stein, Wilmot, & Solomon, 2016). The fact that PTSD may not be diagnosed without the presence of some stressor as the origin of symptoms highlights the importance of this aspect of the disorder (Mezey & Robbins, 2001). This also relevant to the concept of '*Complex Trauma*', where the prolonged or cumulative nature of precipitating traumatic exposure is argued to produce a unique psychopathology; C-PTSD (J. L. Herman, 1992). Researchers have long argued that the qualities of index traumas may be associated with unique pathological development, whereby severe or cumulative trauma causes differential expressions of PTSD symptoms and subtypes (J. Y. Stein et al., 2016).

The theoretical framework of Complex Trauma highlights the importance of both trauma typology and chronicity in the development of post-traumatic pathologies (J. L. Herman, 1992; Williams, 2006). It is argued that traumatic exposure and adversity in childhood may lead to psychological and social disruptions that hinder healthy development and increase the risk of complex psychopathology (Williams, 2006). Authors have additionally noted that severe or interpersonal traumatisation in adulthood may also be indicative of Complex Trauma and lead to the same maladaptation and pathologies (Courtois, 2008). It has been suggested that the effect of traumatic experiences across the life course has an additive effect to the risk of complex post-traumatic symptoms, highlighting the importance of not only the typology and timing of trauma but overall traumatic load (Cloitre et al., 2009).

This chapter presents a review of the extant evidence from a Complex Trauma framework as described above and how this may influence the development of ICD-11 C-PTSD symptomatology.

6.1.1 Trauma Typology

Firstly, the effects of different traumatic experiences in childhood and adulthood are considered. As discussed previously (see *Chapter 1.5.1*) childhood traumatic experiences are argued to be central to Complex Trauma, predisposing individuals for the development of C-PTSD through biopsychosocial factors; e.g. toxic stress, developmental disturbance, and poor relationship attachment (Williams, 2006). Populations reporting childhood abuse and adversity are therefore frequently investigated in relation to C-PTSD due to the higher diagnostic prevalence, and that this characteristic is argued to typically satisfy the prescriptions of being prolonged and repeated (Cloitre et al., 2009).

Evidence from an investigation of C-PTSD pathology among treatment seeking individuals in the UK has indicated that C-PTSD is associated with all aspects of childhood abuse and neglect; Psychological Abuse, Physical Abuse, Sexual Abuse, Emotional Neglect, and Physical Neglect (Karatzias, Shevlin, et al., 2017). This finding is in line with the current empirical consensus linking childhood abuse and maltreatment to C-PTSD (Brewin et al., 2017). This is similarly demonstrated in a representative Danish population sample where childhood physical and sexual abuse was demonstrated to be associated with increased risk for C-PTSD (Hyland, Murphy, et al., 2017). The supposed association between childhood traumatic experiences and C-PTSD laid out by J. L. Herman (1992) is therefore empirically supported.

Research has indicated that in addition to traumatic events in childhood, Adverse Childhood Experiences (ACEs) may increase the risk of C-PTSD. In investigation of traumatic and non-traumatic life events as predictors of PTSD, Frewen, Zhu, and Lanius (2019) report that both lifetime traumatic events and childhood adversities were positively associated with PTSD diagnostics including C-PTSD. Silove et al. (2018) investigated the relationship between C-PTSD and ACEs through examination symptoms among an at-risk population; displaced refugees. This study found that post-migration childhood physical and sexual abuse, and exposure to community and peer violence was associated with C-PTSD diagnosis (Silove et al., 2018). It should however be noted that these analyses showed traumatic events to be the most significant predictor of C-PTSD account for the largest degree of variance (Silove et

al., 2018). This is in keeping with C-PTSD theory as it is expected that distress be anchored to a *significant traumatic experience*. Childhood adversities may not necessarily cause adequate distress to result in C-PTSD however these results suggest they may contribute significantly to development (Silove et al., 2018).

Karatzias et al. (2017) additionally note that the finding of childhood abuse and adversity being linked to C-PTSD may be confounded by the presence of multiple experiences of these. Indeed, this argument is in line with Complex Trauma theory that specifies the additive risk of multiple and cumulative traumatic experiences (Brewin et al., 2017; J. L. Herman, 1992). Given that the experience of childhood trauma is not exclusive nor exhaustive of Complex Trauma and C-PTSD criteria (Powers et al., 2017). It is noted however that ICD-11 guidelines stipulate that childhood abuse and adversity are not necessary causes of C-PTSD, but rather considered risk factors for it (Cloitre et al., 2013). As such the effects of diverse trauma events in adulthood on C-PTSD development have likewise been investigated as antecedents to C-PTSD.

This is demonstrated by Elklit et al. (2014) in a study of C-PTSD among heterogeneous samples exposed to traumatic events in adulthood. This study found that patterns of symptoms indicative of C-PTSD were replicated in three samples reporting parental bereavement (loss of an infant child), sexual assault, and physical assault. This study concluded there is support that C-PTSD may result from traumatic events in adulthood, with sexual assault being most associated with increased risk of C-PTSD of those studied (Elklit et al., 2014). In addition to this, Cloitre et al. (2013) in an investigation of trauma typologies associated with C-PTSD and PTSD found that experience of childhood abuse was not ubiquitous among those with C-PTSD. Indeed, a minority of C-PTSD cases identified (12.4%) reported exposure to the 9/11 terrorist attacks as their index trauma (Cloitre et al., 2013). The authors however note that this traumatic experience was more frequently associated with the PTSD classification (Cloitre et al., 2013).

Results of a population study in Israel further demonstrated C-PTSD to be associated with a range of traumatic experiences in adulthood, specifically; physical assault, sexual assault, unwanted sexual experience, and exposure to human suffering (Ben-Ezra et al., 2018). Likewise, the finding of physical and sexual assault to be associated with C-PTSD is replicated by other studies in Lithuanian (Kazlauskas et al., 2018) and refugee (Frost, Hyland, et al., 2019) samples. Despite this evidence it is argued there is a need for more substantial research into the potential for adult traumatisation to predict C-PTSD outcomes as this remains an under-investigated phenomena (Powers et al., 2017).

Together these results may be argued to fit the description of Complex Trauma proposed originally by J. L. Herman (1992) and revisited by later authors (see Courtois, 2008) where interpersonal victimisation and severe traumatic experiences may lead to post-traumatic affective and relational difficulties representative of C-PTSD. The severity hypothesis is tentatively supported by findings from a heterogeneous trauma-exposed sample comprised of those with accidental, assaultive, childhood, and adulthood experiences concluding that serious injury as a result of trauma to predict C-PTSD pathology (Böttche et al., 2018). The results of this study also showed that multiple experience of trauma were associated an increased risk for C-PTSD over the resilient class (Böttche et al., 2018).

Additionally, Hyland, Murphy, Shevlin, et al. (2017) investigated trauma predictors of PTSD and C-PTSD caseness identified in a Danish treatment-seeking sample. These results showed childhood and adulthood interpersonal trauma, e.g. physical and sexual assault, may both significantly predict C-PTSD class membership. The authors note that childhood physical and sexual assault were the most significant predictors however physical assault in adulthood was also significantly associated with C-PTSD (Hyland, Murphy, et al., 2017). These results are substantiated by findings reported in the UK population similarly highlighting both interpersonal trauma in adulthood and childhood as independent risk factors for C-PTSD (Karatzias, Hyland, et al., 2019). These results demonstrate that childhood trauma is a significant risk factor for C-PTSD however not a necessary requirement as other trauma characteristics may be significant risk factors.

Research supports that traumatic events in adulthood, particular those interpersonal or assaultive in nature may similarly be characteristic of Complex Trauma (Cloitre et al., 2013; Courtois, 2004). While the traumatic events described above may be considered to confer increased risk for the development of C-PTSD these experiences are not prescriptive. The research presented, while supporting the link between these stressors and C-PTSD, also identifies some may be resilient following Complex Traumatic experiences (Elklit et al., 2014). There may consequently be additional characteristics of traumatic experiences beyond typology that contribute to C-PTSD development.

Trauma rarely occurs in isolation with the majority of individuals exposed to two or more traumatic events in their lifetime (Benjet et al., 2016). Indeed, certain characteristics may place individuals and groups at increased risk of multiple traumatic experiences for instance the case of military veterans. The effects of multiple and cumulative traumatic experiences on the development of C-PTSD are considered in the following sub-section.

6.1.2 Cumulative Trauma

Beyond specific trauma types as described above, authors have theorised the experience of continued and cumulative traumatic exposures to be characteristic of Complex Trauma and increase the risk of C-PTSD (Courtois, 2004; J. L. Herman, 1992). Within this assertion it is considered that certain traumatic experiences that are likely to be occur multiple times or sustained over a long period, e.g. domestic violence, abuse, and conflict, may be indicative of Complex Trauma (Courtois, 2004, 2008). It is additionally speculated that exposure to multiple forms of trauma, '*polytraumtisation*', may similarly confer additional risk of C-PTSD development (Williams, 2006). Research has indicated that those exposed to childhood trauma and abuse are more likely to go on to report additional traumatic experiences in adulthood (Cloitre et al., 2009). Indeed, research has supported that those exposed to assaultive or interpersonal traumas in childhood and adolescence are likely to subsequently experience additional interpersonal victimisation later in life (E. Sullivan, Contractor, Gerber, & Neumann, 2017).

The previously cited work of Hyland, Murphy, Shevlin, et al. (2017) additionally investigated the effects of cumulative childhood traumatic experiences on C-PTSD risk. These results showed that those who reported one or two childhood traumas were over twice as likely to be at risk for C-PTSD. Moreover, those reporting three or more childhood traumas were noted to be over 77 times as likely to meet criteria for C-PTSD rather than PTSD (Hyland, Murphy, et al., 2017). These results highlight the importance of cumulative childhood trauma history on C-PTSD risk.

It is argued that the cumulative load of multiple traumatic stressors across the life course is a feature of Complex Trauma and increases risk of C-PTSD pathology. This hypothesis is illustrated by the work of Cloitre et al. (2009) demonstrating the additive effect of life course *polytraumtisation*. In this investigation Cloitre et al. (2009) assessed the effect of life course histories among treatment-seeking women and children, and the influence this had on symptom complexity, i.e. number of symptoms reported beyond traditional PTSD criteria. The results of this study showed that cumulative trauma in childhood and across the life course was predictive of greater symptom complexity, however adult cumulative exposure when controlling for childhood trauma was rendered non-significant. This prompts the conclusion that childhood stressful exposure is the true driving factor in the development of C-PTSD while adult traumatic experiences merely add traumatic load and increase the risk of C-PTSD (Cloitre et al., 2009).

This assertion is partially supported by the work of Frewen et al. (2019) finding that while both ACEs and lifetime cumulative traumatic experiences were associated with increased risk of C-PTSD diagnosis, cumulative ACEs were the more significant predictor of this outcome. This is similarly upheld by Karatzias et al. (2017) concluding that both child and adult trauma histories are associated with C-PTSD classification. In this study each childhood trauma was associated with 1.58 times increased likelihood of C-PTSD, and each lifetime trauma associated with 1.30 times increased likelihood of C-PTSD. Additionally, Karatzias et al. (2017) modelled both childhood trauma and stressful life events together as predictors of C-PTSD finding the latter to become non-significant as a predictor. This finding is in agreement with Cloitre et al.

(2009) suggesting the superiority of childhood traumatic experiences as predictors of C-PTSD.

Despite this, the sum of lifetime traumatic events remains an important predictor of C-PTSD given the risk of exposure to multiple traumas as previously cited (E. Sullivan et al., 2017). Indeed, studies have found that the majority of those with C-PTSD report traumatic events in both childhood and adulthood (Cloitre et al., 2014). Evidence has implied the development of C-PTSD pathology may function in a dose-response many with cumulative trauma. Indeed, C-PTSD has been evidenced to be a potential outcome in relation to experience of multiple childhood adversities (Hyland, Murphy, et al., 2017) and lifetime traumas (Frost, Hyland, et al., 2019). It is therefore of critical importance to consider the additive effects of multiple traumatic life events and their contribution to C-PTSD.

These conclusions are notably contrasted by Wolf et al. (2015) in a study of C-PTSD among US community and veteran population concluding in both samples those with C-PTSD did not differ significantly to PTSD cases with regard to reported trauma history. The authors conclude this to be evidence to support the discard of C-PTSD, however it may equally be argued that environmental factors may confound these results. Both samples used reported high levels of DSO symptoms which may confound results related specifically to ICD-11 C-PTSD. One such environmental confounding factor potentially contributing to this is that of *Traumagenic Environments*; a context which lends itself to stressful exposure and fosters the maladaptation following (Baranowsky & Gentry, 2014). This framework, typically applied to cases of childhood and domestic victimisation, theorises that behaviours and affective strategies, e.g. emotional hypoactivity, may be adopted as they serve and adaptive purpose but become pathological when they no longer serve this purpose (Baranowsky & Gentry, 2014).

This is exemplified in a study by Jonkman, Verlinden, Bolle, Boer, and Lindauer (2013) finding that children exposed to chronic adversity and Complex Trauma were more likely to experience difficulties including behaviour, interpersonal, and emotional

regulation problems in absence of PTSD symptomology. This provides a mechanistic explanation through which some environmental and experiential factors may contribute specifically to the development of DSO symptoms. It is however argued that the *Traumagenic* model may be extended beyond the context of childhood trauma and apply to understanding Complex Trauma among military veterans and within the context of post-conflict societies like NI.

6.1.3 Complex Trauma Among NI Veterans

The evidence presented thus far illustrates theoretical and empirical assertions regarding the characteristics associated with Complex Trauma and C-PTSD. Unique consideration is however offered to the traits of the study population and the risk these constitute for Complex Trauma, and for C-PTSD.

Firstly, in military population at large researchers acknowledge the risk of this occupational group to sustain Complex Traumatic Exposure. The investigation of Complex Trauma as discussed generally characterises this through experience of chronic and interpersonal trauma leading to an increased risk for C-PTSD as an outcome (Courtois & Ford, 2019). It has been argued that military service fits a broad application of this definition as service personnel engage in prolonged periods of dangerous activities, including combat, which satisfy the criteria mentioned above (Courtois & Ford, 2019; Landes, Garovoy, & Burkman, 2013).

Previously researchers have found that DESNOS, a spiritual precursor of the now recognised C-PTSD, among military veterans in the US is predicted not only by childhood traumatisation but participation in warzone atrocities (Ford, 1999). Ford (1999) notes that this relationship was observed for DESNOS independently, i.e. without PTSD, suggesting that this pathology to be related but distinct from PTSD, akin to the concept of C-PTSD. This evidence therefore promotes the notion that there may be Complex Traumatic experiences within military service that mean C-PTSD may be a relevant concern for service personnel and veterans. Indeed, it has also been speculated that such pathologies is likely to become a growing problem in

military populations owing to persistent treat of attack through extended operational duties and the increasing prevalence of insurgent combat (Iribarren et al., 2005).

Furthermore, those in the military have been found to be more likely to report childhood adversities than the general population (Landes et al., 2013). A study of the prevalence of ACEs and their influence of mental ill-health among UK service personnel found that pre-enlistment adversity was reported by the majority of participants with, 76% of those sampled reporting two or more adversities (Iversen et al., 2007). Predeployment adversity was additionally associated with more poor psychological health following trauma (Iversen et al., 2007). These findings highlight the potential for multiple traumatic experiences in the veteran population. Paired with the aforementioned additive effects of multiple trauma exposures on psychopathological outcomes (see Cloitre et al., 2009) highlight the potential risk for C-PTSD development for this group.

In addition to these risk factors relating to service personnel more generally, the unique context in NI may be argued to confer additional risk for Complex Traumatic exposure.

As previously suggested NI may be considered a *Traumagenic Environment* for former service personnel. With perceived threat of on- and off-duty (C. Armour, Walker, et al., 2018), and potential reminders of past trauma for those who continue to live in NI there may be increased risk for C-PTSD pathology. As discussed in relation to cumulative trauma the effects of the NI traumagenic environment produce maladaptive or pathological behaviours (Baranowsky & Gentry, 2014). For instance, heightened awareness of one's environment may be beneficial during combat or conflict however where objective danger is removed this may be considered a maladaptive hyperarousal behaviour.

Solomon, Dekel, and Mikulincer (2008) found in a longitudinal study of PTSD pathology among Israeli ex-POW veterans that symptom severity increased 30-years post deployment attributing this finding to current environmental effects. The authors note that an increase in threat of violence and terrorism present at the time

of survey may be associated in re-emergence of PTSD symptoms. Previous qualitative work conducted with veterans in NI has reported veterans in NI continue to feel concerns for their personal security, fearing attack from dissident paramilitary forces (C. Armour, Walker, et al., 2018). The current study argues that in a similar fashion where C-PTSD is experienced by NI veterans that the perceived threat and traumatic reminders present in the environment serve to maintain symptoms or re-traumatise individuals making current C-PTSD more likely.

This rationale is likened previous work conducted with veteran ex-POWs asserting that traumatic experiences outside the purview of military service (i.e. captivity) is associated with C-PTSD due to twisted interpersonal relations between veterans and captors (Zerach et al., 2019). Due to the nature of the role many service personnel maintain callousness or emotional distance to cope with potentially stressful experiences. Drescher and Foy (2008) argue that military operations with insurgent combat similarly pose a risk to interpersonal relationships as this distrust and coldness it extended to all civilians. Moreover, many of those who served in NI would do so on a part-time basis maintaining a civilian job in addition to their role in the Armed Forces. In this context; veterans in NI may perceive heightened interpersonal threat from an unknown enemy, who could be seen in any civilian. This experience is argued to warp interpersonal relationships and similarly result in affective, cognitive, and interpersonal distortions that constitute DSO symptoms.

Moreover, researchers have found that endorsement of conflict related trauma in NI and greater perceived impact of these events on one's life to predict DESNOS and C-PTSD symptoms (Dorahy et al., 2009). Indeed, within a treatment-seeking population exposed to Troubles-related traumatic stress it was noted that C-PTSD symptoms and diagnosis was common (Dyer et al., 2009). Dyer et al. (2009) argue that the multiplicity and chronicity that is associated with conflict-related trauma in NI may result in increased complexity of psychopathology. This is consistent with findings from an investigation of health outcomes and legacy of The Troubles indicating that those with direct and multiple exposures to conflict to suffer poorer psychological health and be more likely to experience PTSD (Muldoon, Schmid, Downes, Kremer, & Trew, 2005).

The aforementioned evidence however relates to the experiences of civilians during the NI conflict. It is argued that those who completed military service in NI as part of the UDR and Royal Irish regiments are likely to have experienced multiple conflict-related stressors and hence be at risk for C-PTSD. As such the extant evidence regarding C-PTSD and traumatic stress in NI together suggest the experiences of the NI military veteran population to be significant risk factors for C-PTSD.

6.1.4 Study Aims

Given the evidence presented herein the aim of this study is to utilise Complex Trauma theory as a framework to examine the ability of quality and quantity of traumatic events to predict C-PTSD pathology. This is accomplished through examination of a number of traumatic events, cumulative trauma in childhood and adulthood, and contextual traumatic exposure through military service in NI as predictors of C-PTSD.

In line with prior theory and evidence it is hypothesised that C-PTSD will be significantly predicted by interpersonal and childhood traumatisation, as well as cumulative exposure. Beyond this, it is also hypothesised that exposure to warzone danger and the specific context of NI military service will be significantly associated with C-PTSD group membership.

6.2 Methodology

6.2.1 Measures

Sociodemographic Information was assessed using a bespoke inventory of items assessing universal characteristics in addition to specific characteristic associated with respondent's military service. Full information regarding this measure may be found in *Chapter 2; Measures and Survey Structure.* Of these Age, Sex, Marital Status, and Highest Educational Attainment were specifically of interest in the current investigation. Gender was dummy codded with "1" equal to Female and "2" corresponding to Male. No other gender responses were endorsed by participants. Marital status was dichotomised to Single/Separated/Widowed (1) and Married or In a Relationship (2). Highest educational attainment was sequentially equated to and categorised corresponding to No formal qualifications (1), GCSE (2), A Level (3), Higher Education Diploma (4), and Bachelor's or Post-graduate degree (5).

PTSD and *C-PTSD* was examined using the International Trauma Questionnaire (ITQ; Cloitre et al., 2018), an 18-item measure of ICD-11 defined post-traumatic stress. This measure is divided into two sub-scales; six items measuring symptoms of PTSD (Hyperarousal, Re-experiencing, and Avoidance) and 6 items measuring DSO symptoms characteristic of C-PTSD (Interpersonal difficulties, Difficulties with affect regulation, and Negative self-concept). Each of these sub-scales contain an additional three items measuring functional impairment associated with each set of symptoms. Diagnostic criteria require endorsement (≥ 2, "*Moderately*") of one symptom from each cluster and one domain of impairment.

Traumatic Exposure and Childhood Adversity was assessed using an adapted version of the Stressful Life Events Screening Questionnaire (SLESQ; Goodman, Corcoran, Turner, Yuan, & Green, 1998) and the Adverse Childhood Experiences Questionnaire (ACE-Q; Felitti et al., 1998). The original SLESQ developed for use with DSM-IV inquires about 13 recognised stressful life events allowing for dichotomous (Yes/No) endorsement of each. In addition, four items were adapted from the Life Events

Checklist for DSM-5 (see Gray, Litz, Hsu, & Lombardo, 2004) screening for; *exposure to natural disasters*, *fire or explosions*, *toxic substances*, and *repeated details of traumatic experiences*. These items were incorporated with the same dichotomous response options presented with other SLESQ items producing a total of 17 potential endorsements. Where participants responded exposure to potentially traumatic stimuli "*Only on TV, a movie, or the internet*" this was coded as *Not Endorsed*.

The ACE-Q specifically about instances of abuse, neglect, and experience of household dysfunction prior to the age of 18. The ACE-Q allows dichotomous endorsement (Yes/No) of 10 experiences of adversity and maltreatment under seven categories; Physical Abuse, Psychological Abuse, Sexual Abuse, Maternal Victimisation, Household Substance Abuse, Household Mental Illness, Parental Separation, and Household Member Incarceration. The ACE-Q is a widely used and validated instrument for screening experiences of childhood maltreatment across numerous populations and contexts (Zarse et al., 2019).

Finally, a dichotomous (Yes/No) variable assessing '*Home Service in NI*' was used as a proxy measurement of the cumulative stress and psychological trauma associated with increased fear and on-going perceived personal threat reported by NI veterans (C. Armour, Walker, et al., 2018, 2017). This unique service experience is of interest to this investigation due to the prolonged sense of generalised treat and potential for repeated traumatisation and generalisation of threat due to living in a previous theatre of operation (see Solomon, Dekel, & Mikulincer, 2008).

6.2.2 Procedure

The current investigation sought to build on the previous chapter, *5.0 Latent Profile Analysis of ICD-11 C-PTSD Among Military Veterans Living in Northern Ireland,* and further analyse the previously identified latent symptomatic profiles. This involves examining the extent to which various traumatic events predict most likely class membership as previously imputed (see *Chapter 5.3.3*). This method is in line with the *Classify-Analyse* approach to LCA. This method involves the tabulation of latent class membership followed by use of this as a manifest variable in subsequent

analyses (Lanza & Rhoades, 2013). This is considered an effective and straight-forward approach to post-hoc analysis of latent classes (Lanza & Rhoades, 2013). This method of analysis is widely applied to study latent class membership as both an outcome and predictor in regression analyses (Bray, Lanza, & Tan, 2015).

The relevant study variables were assessed for missingness within the dataset used in the previous study (*Chapter 5*), and were found to satisfy the MCAR condition (Little's MCAR Test: $\chi 2$ (274, n = 357) = 306.388, p = .086). Excessive missingness on the SLESQ and ACE-Q resulted in the removal of n = 6 cases as missing data exceeded 20% yielding a usable dataset of n = 351. Those included were compared to those excluded on the key variables for this study using Chi-square tests of independence (see Appendix 3.3). Results showed that these groups did not differ significantly in endorsement of any trauma experience(s). Data were assessed regarding the assumptions for multinomial logistic regression (see Stoltzfus, 2011) and found to satisfy these. In testing for multicollinearity some variables were moderately correlated (e.g. *SLESQ10*, *ACE1,* & *ACE2*), however all predictors were found to fall within acceptable parameters on Variance Inflation Factor and Tolerance and therefore unlikely to be problematic (see Appendix 4.0).

As predictors were categorical in nature it was decided that use of the Robust Maximum Likelihood (MLR) function in Mplus 7.3.1 (L. K. Muthén & Muthén, 2015) would provide adequate estimation of missing data. Estimation of missing categorical and binary data using Maximum Likelihood techniques is considered appropriate in regression modelling (Graham, Cumsille, & Shevock, 2012).

6.2.3 Participants

This study utilised a derivative of participant sub-sample identified by the previous investigation (see *Chapter 5.2.3*, *Table 5.1*) with n = 6 participants removed owing to excessive missing data on primary study variables in this investigation.

Table 6.1; Chapter Six Participant Demographic information, N = 351

Variable	***n* (%)**
Gender/Sex	
Male	313 (89.2)
Female	38 (10.8)

Variable	***n* (%)**
Marital Status	
Single/Widowed/Separated	94 (26.8)
Married/In Relationship	257 (73.2)
Educational Attainment	
No Qualifications	56 (16.0)
GCSE*	96 (27.4)
A-level*	47 (13.4)
Higher Education Diploma*	62 (17.7)
Bachelors or Post-Graduate Degree*	89 (25.4)
Refused/Missing	1 (0.3)
Employment	
Unemployed	12 (3.4)
Self Employed	21 (6.0)
Employed (Full-time)	141 (40.2)
Employed (Part-time)	22 (6.3)
Student/Full-time Education	7 (2.0)
Unable to Work	27 (7.7)
Retired	72 (20.5)
Medically Retired	42 (12.0)
Full-time Carer	6 (1.7)
Refused/Missing	1 (0.3)
Branch	
Royal Navy	17 (4.8)
Royal Marines	7 (2.0)
Army	304 (86.6)
Royal Air Force	23 (6.6)
Rank	
Officer	61 (17.4)
Non-Commissioned Officer	195 (55.6)
Other Ranks	95 (27.1)
Time in Regular Service	
Never	30 (8.5)
Less than One Year	2 (0.6)
Up to 10 years	121 (34.5)
11-20 Years	102 (29.1)
20+ Years	93 (26.5)
Refused/Missing	3 (0.9
Time in Reserve Service	
Never	149 (42.5)
Less than One Year	14 (4.0)
Up to 10 years	120 (30.4)
11-20 Years	27 (7.7)
20+ Years	24 (6.8)
Refused/Missing	17 (4.8)
Current reservist	
Yes	34 (9.7)
No	317 (90.3)

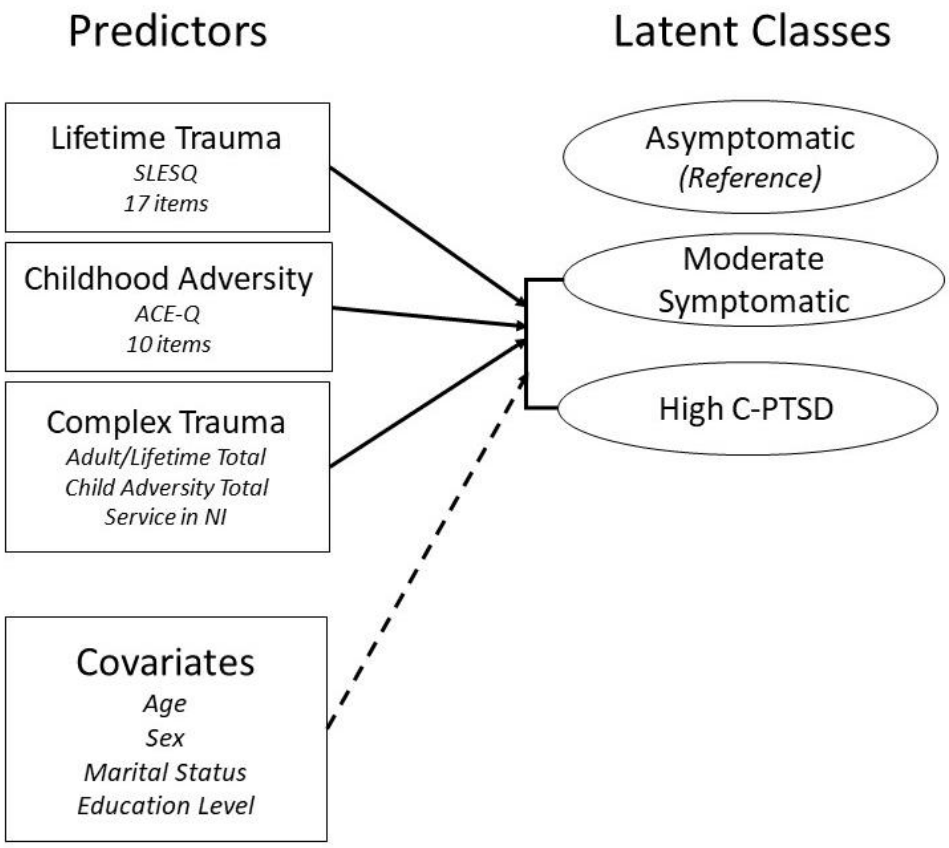
Service in Northern Ireland	
Yes	171 (48.7)
No	179 (51.0)
Refused/Missing	1 (0.3)

Respondent age ranged between 27 and 86 in this sub sample (*M* = 54.74, *SD* = 11.35). The majority of participants were male (89.2%) and endorsed being married or in a romantic relationship (73.2%). Just under half of the current sample (48.7%) reported serving in NI a part of home service branches. The most common service characteristics were service in the Army (86.6%) and achieving a highest rank of Non-commissioned Officer (55.6%).

6.2.4 Data Analytic Plan

Each of the 17 recognised traumatic events codified by the SLESQ, and 10 childhood adversities on the ACE-Q, were regressed onto previously identified latent symptomatic profiles of PTSD and C-PTSD to examine if trauma type predicted probable diagnosis of either condition. Additionally, in line with C-PTSD theory and supporting evidence (see Cloitre et al., 2018) the potential of cumulative traumatic and stressful exposure to predict C-PTSD was examined. Research has shown the sum of traumatic event exposures across the lifespan to be highly predictive of PTSD symptomology (Briere, Kaltman, & Green, 2008; Kabach, Schaal, & Elbert, 2015). Hence the composite sum of traumatic event endorsements by the SLESQ and ACE-Q respectively were also regressed onto latent classes to assess the predictive power of this measurement for discerning *PTSD* and *C-PTSD* profiles. Select socio-demographic characteristics were also included as co-variates in these analyses owing to prior evidence of their influence on the risk of PTSD and C-PTSD pathology (see Perkonigg et al., 2016; Xue et al., 2015). These traits were; *Age*, *Sex*, *Marital Status*, and *Educational Achievement*. These analyses are represented by *Figure 6.1* overleaf;

Figure 6.1; Latent Profile Predictor Regression Model



The statistical technique employed, *Multinomial Logistic Regression*, results in a reported *Odds Ratio*; a value representing the likelihood of occurrence of an outcome given the effect of a predictor variable (Szumilas, 2010). In this circumstance the reported statistic indicates the likelihood that endorsement of the *Trauma Event Exposure* will predict *Moderate Symptomatic* and *High C-PTSD* class membership as described in the previous chapter (see *Chapter 5.3.3*) relative to the *Asymptomatic* group.

6.3 Results

6.3.1 Trauma and Adversity Prevalence

Based on the research questions and objectives of the current study trauma endorsement was examined at the item level and a composite total of trauma endorsements was used qualifying repeated or Complex Trauma. All participants had endorsed experiencing at least one traumatic life event on the SLESQ.

Table 6.2; Participant Endorsement of Traumatic Events and Adversities

Trauma/Stressful Event	*Endorsed* *N* (%)	*Worst Trauma* *N (%)*
Stressful Life Events		
Life-threatening illness	119 (33.9)	31 (8.7)
Life-threatening accident	146 (41.5)	24 (6.7)
Natural Disaster	82 (23.4)	1 (0.3)
Fire or Explosion	287 (81.8)	59 (16.5)
Toxic Substance	89 (25.4)	2 (0.6)
Robbery or mugging	75 (21.4)	13 (3.6)
Relation death (Accident, homicide, or suicide)	185 (52.7)	58 (16.2)
Sexual Assault (Completed)	38 (10.8)	2 (0.6)
Sexual Assault (Attempted)	27 (7.7)	1 (0.3)
Sexual Assault (Touching)	53 (15.1)	1 (0.3)
Childhood Physical Assault	107 (30.5)	8 (2.2)
Adult Physical Assault	143 (40.7)	2 (0.6)
Threatened with a weapon	157 (44.7)	17 (4.8)
Caused injury/harm to someone else	75 (21.4)	9 (2.5)
Witness killing, injury, or assault	224 (63.8)	49 (13.4)
Exposed to trauma details	201 (57.3)	26 (7.3)
Combat/Warzone & Other Danger	240 (68.4)	46 (12.9)
Adverse Childhood Experiences		
Psychological abuse	110 (31.3)	-
Physical abuse	108 (30.8)	-
Sexual abuse	45 (12.6)	-
Emotional Neglect	96 (26.9)	-
Physical Neglect	38 (10.6)	-
Parental Separation	83 (23.2)	-
Mother treated violently	45 (12.6)	-
Family Substance Abuse	85 (23.8)	-
Family Mental Ill-Health	81 (22.7)	-
Family Incarceration	12 (3.4)	-

Table 6.2 above details the endorsement rates of various potentially traumatic experiences from the SLESQ and ACE-Q. As this was a trauma-exposed sub sample all

respondents reported at least one item on the SLESQ. Of the 17 trauma types the most frequently endorsed were; *Experiencing Fire or Explosion*, *Present in Warzone or Dangerous Situation*, and *Exposure to Serious Injury, Assault or Death*. This observation is relatively intuitive given the previous military occupational experience of the study population which may be likely to encompass these experiences.

The most commonly cited index traumas or 'worst events' largely mirrored those most frequently endorsed as a whole; *Experiencing Fire or Explosion*, *Death of Family or Close Friend*, *Present in Warzone or Dangerous Situation*, and *Exposure to Serious Injury, Assault or Death*. A small number of respondents (*n* = 9, 2.5%) endorsed one or more traumatic experiences but declined to elect a worst event. A composite measure of lifetime trauma exposure was calculated using the total number of item endorsements on the SLESQ ranging from 1 to 17. The mean number of different traumatic experiences endorsed by participants was 7.27 (SD = 3.40).

The majority of the sample (64.2%) reported experiencing at least one childhood adversity. The most frequently reported childhood adversities were; *Psychological Abuse*, *Physical Abuse*, and *Emotional Neglect*. A composite sum of childhood adversities was likewise calculated ranging from 1 to 10. The mean number of adversities reported was 1.99 (*SD* = 2.29).

6.3.2 Trauma Typology as Predictors of Latent Profiles

Following identification of trauma event and adversity prevalence, binary coded endorsement of each event was regressed onto most likely class membership identified in *Chapter 5*. The odds of positive endorsement on symptom class membership relative to the *Asymptomatic* group (Class 1) were estimated controlling for demographic variables (*Age*, *Sex*, *Marital Status*, and *Educational Attainment*) and the effects of other trauma exposures to reduce the confounding effects of polytraumtisation. Tests of model fit showed this predictor model to provide poor fit to the data ($\chi 2$ (42, n = 351) = 148.282, $p < .001$). This however should not be cause for model dismissal as the chi-square statistic is sensitive when sample sizes are

larger, i.e. < 200 (Tanaka, 1987). This model was found to account for 21% of the variance in Most Likely Class Membership (McFadden R^2 = .205).

The results of this series of multinomial logistic regressions is shown in *Table 6.3*.

Table 6.3; Stressful Life Events as Predictors of Most Likely Class Membership

Predictor	Moderate Symptomatic *vs. Asymptomatic*	High C-PTSD *vs. Asymptomatic*
	OR (*95% CI*)	OR (*95% CI*)
1. Life-threatening illness	0.627	1.365
	(0.310 - 1.267)	(0.689 - 2.704)
2. Life-threatening accident	1.309	1.092
	(0.713 - 2.404)	(0.578 - 2.064)
3. Natural Disaster	0.603	0.702
	(0.299 - 1.214)	(0.354 - 1.393)
4. Fire or Explosion	1.071	**4.212***
	(0.483 - 2.377)	(1.330 - 13.337)
5. Toxic Substance	1.381	1.802
	(0.687 - 2.774)	(0.845 - 3.843)
6. Robbery or mugging	1.449	1.668
	(0.666 - 3.150)	(0.728 - 3.820)
7. Relation death (accident, homicide, or suicide)	0.809	1.384
	(0.429 - 1.527)	(0.717 - 2.672)
8. Sexual Assault (Completed)	1.781	0.787
	(0.380 - 8.360)	(0.180 - 2.672)
9. Sexual Assault (Attempted)	0.816	1.436
	(0.167 - 3.972)	(0.317 - 6.506)
10. Sexual Assault (Touching)	0.853	2.426
	(0.211 - 3.448)	(0.585 - 10.060)
11. Childhood Physical Assault	**2.350***	**3.679*****
	(1.146 - 4.820)	(1.812 - 7.469)
12. Adult Physical Assault	1.235	1.703
	(0.635 - 2.404)	(0.863 - 3.362)
13. Threatened with a weapon	1.122	0.614
	(0.577 - 2.179)	(0.307 - 1.227)
14. Caused injury/harm to someone else	1.264	0.564
	(0.582 - 2.748)	(0.236 - 1.348)

Table 6.3 Continued

Predictor	Moderate Symptomatic *vs. Asymptomatic* OR (*95% CI*)	High C-PTSD *vs. Asymptomatic* OR (*95% CI*)
15. Witness killing, injury, or assault	0.952	1.347
	(0.482 - 1.880)	(0.613 - 2.961)
16. Exposed to trauma details	1.802	1.537
	(0.857 - 3.791)	(0.703 - 3.360)
17. Other Danger (e.g. Warzone)	0.937	2.079
	(0.454 - 1.933)	(0.895 - 4.832)
Covariates		
Gender	0.768	0.597
	(0.288 - 2.047)	(0.202 - 1.761)
Age	**0.949****	**0.945*****
	(0.921 - 0.978)	(0.915 - 0.975)
Marital Status	0.837	0.608
	(0.392 - 1.787)	(0.278 - 1.327)
Education	**0.756***	**0.614*****
	(0.607 - 0.941)	(0.475 - 0.794)

Note: Class 1 = Asymptomatic (Reference category), Class 2 = PTSD/Moderate Symptoms, Class 3 = C-PTSD. OR = Odds Ratio, CI = Confidence Interval.
*Significant results highlighted in bold. * p < .050, ** p < .010, *** p < .001*

Of all stressful life events under investigation only *Childhood Physical Assault* was associated with significantly increased odds of both *Moderate Symptomatic* (OR = 2.35, 95% CI = 1.15 - 4.82) and *High C-PTSD* (OR = 3.28, 95% CI = 1.81 - 7.47) class memberships. *Exposure to Fire or Explosion* significantly predicted increased likelihood of *C-PTSD* class membership only (OR = 4.21, 95% CI = 1.33 - 13.34).

Of the covariates included in this model; younger age and lower educational attainment were found to be associated with increased odds of both *Moderate Symptomatic* and *High C-PTSD* class membership relative to the *Asymptomatic* class.

Table 6.4; Childhood Adversities as Predictors of Most Likely Class Membership

Predictor	Moderate Symptomatic *vs. Asymptomatic* OR (*95% CI*)	High C-PTSD *vs. Asymptomatic* OR (*95% CI*)
1. Psychological Abuse	1.325	2.023
	(0.478 - 3.672)	(0.521 - 7.865)
2. Physical Abuse	1.297	0.799
	(0.507 - 3.320)	(0.219 - 2.917)
3. Sexual Abuse	1.335	**3.089***
	(0.504 - 3.538)	(1.288 - 7.405)
4. Emotional Neglect	**3.158***	**3.381***
	(1.281 - 7.786)	(1.316 - 8.686)
5. Physical Neglect	0.628	1.288
	(0.184 - 2.136)	(0.465 - 3.567)
6. Parental Separation	0.509	**0.234****
	(0.236 - 1.099)	(0.091 - 0.604)
7. Mother treated violently	0.685	**3.386***
	(0.227 - 2.068)	(1.170 - 9.802)
8. Family Substance Abuse	1.704	0.674
	(0.798 - 3.507)	(0.292 - 1.554)
9. Family Mental Ill-Health	1.007	0.788
	(0.455 - 2.229)	(0.352 - 1.765)
10. Family Incarceration	0.352	0.647
	(0.032 - 3.872)	(0.086 - 4.856)
Covariates		
Gender	0.987	0.784
	(0.389 - 2.503)	(0.306 - 2.011)
Age	**0.930*****	**0.926*****
	(0.900 - 0.960)	(0.898 - 0.955)
Marital Status	0.815	0.655
	(0.401 - 1.658)	(0.325 - 1.324)
Education	**0.746****	**0.654****
	(0.609 - 0.913)	(0.524 - 0.815)

Note: Class 1 = Asymptomatic (Reference category), Class 2 = PTSD/Moderate Symptoms, Class 3 = C-PTSD. OR = Odds Ratio, CI = Confidence Interval.
*Significant results highlighted in bold. * p < .050, ** p < .010, *** p < .001*

Similar to the previous model, a test of model fit suggested this predictor model to provide poor fit to these data ($\chi 2$ (28, n = 351) = 118.997, p < .001). This model was however found to predict 17% of the variance in Most Likely Class Membership (McFadden R^2 = .166).

Endorsement of *Emotional Neglect* predicted increase odds of both *Moderate Symptomatic* (OR = 3.16, 95% CI = 1.281 - 7.786) and *High C-PTSD* (OR = 3.38, 95% CI

= 1.32 - 8.69) class membership. Two further childhood adversities were found to be uniquely associated with increase odds of *High C-PTSD* class membership namely; *Childhood Sexual Abuse* (OR = 3.09, 95% CI = 1.29 - 7.41) and *Witnessing Violence Toward Mother* (OR = 3.39, 95% CI = 1.17 - 9.80). Notably, *Parental Separation* was associated with a decreased likelihood of *High C-PTSD* class membership (OR = 0.23, 95% CI = 0.09 - 0.60).

Consistent with the previous model younger age and lower educational attainment were again found to predict both symptomatic class memberships relative to the *Asymptomatic* group.

6.3.3 Cumulative Trauma as a Predictor of Class Membership

In this stage of analysis composite totals of lifetime stressful events and ACEs were regressed on Most Likely Class membership to examine the predictive effects of cumulative trauma on symptoms class outcome. 'Home Service in NI' was also used as a proxy measurement of contextual stress/trauma associated with living within one's operational theatre. Once again results of a chi-square test of model fit suggested this model to provide a poor fit to these data ($\chi 2$ (62, n = 351) = 178.615, p < .001). This predictor model was found to predict 25% of the variance in Most Likely Class Membership (McFadden R^2 = .254).

Table 6.5; Contextual and Cumulative Traumatic Events as Predictors of Most Likely Class Membership

Trauma/Stressful Event	Moderate Symptomatic *vs. Asymptomatic* OR (*95% CI*)	High C-PTSD *vs. Asymptomatic* OR (*95% CI*)
Lifetime SLESQ Traumas	**1.154****	**1.368*****
	(1.047 - 1.271)	(1.227 - 1.526)
Total ACEs	**1.195***	**1.302*****
	(1.039 - 1.374)	(1.123 - 1.509)
Home Service in NI	1.244	**1.836***
	(0.696 - 2.223)	(1.047 - 3.219)

*Note: Class 1 = Asymptomatic (Reference category), Class 2 = PTSD/Moderate Symptoms, Class 3 = C-PTSD. OR = Odds Ratio, CI = Confidence Interval. ACE = Adverse Childhood Experiences, SLESQ = Stressful Life Events Screening Questionnaire. Significant results highlighted in bold. * p < .050, ** p < .010, *** p < .001.*

Moderate Symptomatic class membership was significantly predicted by both cumulative SLESQ (OR = 1.15, 95% CI = 1.04 – 1.27) and ACE endorsements (OR = 1.20, 95% CI = 1.04 – 1.37) with greater exposure associated with an increased likelihood of group membership. 'Home service in NI' was associated with increased odds of *Moderate Symptomatic* class membership however this was found to not be statistically significant (OR = 1.24, 95% CI = 0.696 - 2.223).

High C-PTSD class membership was significantly predicted by all cumulative trauma variables. Stressful life event endorsement was associated with increased odds (OR= 1.37, 95% CI = 1.227 - 1.526) of class membership, meaning that for each item on the SLESQ endorsed the likelihood of *High C-PTSD* class membership increased by 1.37 times. Similarly, each ACE endorsement it is expected to increase the likelihood of *High C-PTSD* class membership by 1.30 times (OR = 1.302, 95% CI = 1.123 - 1.509).

Finally, '*Home Service in NI*' was found to significantly predict only *High C-PTSD* class membership. This was associated with 1.84 times greater likelihood of class membership where participants reported having served in NI home service compared to never having done so (OR = 1.836, 95% CI = 1.047 - 3.219).

6.4 Discussion

This study endeavoured to examine the role of traumatic and stressful experiences to predict C-PTSD pathology as categorised by LPA previously presented (see *Chapter 5.3.2; Latent Profiles of C-PTSD*). These were examined using Complex Trauma as a theoretical framework; examining the effects of traumatic events in childhood and adulthood, as well as cumulative trauma and adversity.

6.4.1 Trauma Typology Predictors

Of the stressful life events under investigation only *Exposure to Fire or Explosion* and *Childhood Physical Assault* were found to independently predict *High C-PTSD* class membership. These findings are somewhat at odds with expectations previously outlined. Interpersonal trauma and victimisation were hypothesised to independently predict C-PTSD class membership due to consistency with Complex Trauma definitions (Courtois, 2008). This divergence in results might be owing to the use of a military veteran sample and typical experiences of this group. The observation of non-significant results regarding prediction of C-PTSD by a number of stressors in adulthood however supported hypotheses that traumatic exposure in childhood would be a more salient risk factor for C-PTSD. Given these novel findings the predictive qualities of trauma typology is considered;

Firstly, the finding that *Exposure to Fire or Explosion* was a significant predictor of *High C-PTSD* class membership is an interesting one to consider. The NI conflict, known colloquially as 'The Troubles', has been acknowledged to be associated with complex and chronic post-traumatic symptomatology likened to that described by ICD-11 C-PTSD (Dorahy, 2006; Dorahy et al., 2009). Given that bombing campaigns are a recognisable part of the NI conflict and associated with some of the most severe and high profile incidents in this time (C. Armour, Waterhouse-Bradley, et al., 2018) it is possible that this endorsement is indicative of conflict and service-related trauma predicting C-PTSD. It is, however, also possible that endorsement of this item reflects exposure to non-conflict related experiences such as witnessing an accidental fire. Both experiences may however be argued to be linked to feelings of helplessness,

e.g. inability to tackle or make sense of a grave experience, which may be considered part of Complex Trauma (Williams, 2006). Conclusions regarding this relationship are however limited due to the lack of qualitative information regarding the traumatic event to which endorsement corresponds.

The other item on the SLESQ to independently and significantly predict *High C-PTSD* and *Moderate Symptomatic* class membership was *Childhood Physical Assault*. This finding is in keeping with definitions of Complex Trauma as an interpersonal experiences of trauma or victimisation in childhood (J. L. Herman, 1992). This finding is in line with those of Hyland, Murphy, Shevlin, et al. (2017) which showed childhood physical assault to be a robust predictor of C-PTSD. Contrary to the results of Hyland, Murphy, Shevlin, et al. (2017), the current study did not also identify adulthood physical assault and sexual abuse/assault to be significant predictors. It is possible this finding is a result of differences in measurement. The SLESQ item used in this study inquired about *lifetime sexual assault* where Hyland, Murphy, Shevlin, et al. (2017) specifically measured *sexual abuse in childhood*. It is argued that the interpersonal dynamics of abuse in childhood contribute to the processes and development of C-PTSD above the effects of single traumatic exposure (J. L. Herman, 1992). As such the potential importance of childhood exposure and abuse dynamics are highlighted by these results.

Consistent with theoretically and empirically informed expectations (Cloitre et al., 2009; J. L. Herman, 1992) a number of childhood adversities and traumatic experiences significantly predicted C-PTSD class membership. Those experiences that independently predicted C-PTSD class membership were; *Sexual Abuse*, *Emotional neglect*, and *Witnessing maternal victimisation*. These results are in line with the foundational perspectives of Complex Trauma stating that interpersonal victimisation and highly traumatic experiences in childhood result in C-PTSD specifically exampling sexual abuse and domestic violence as exemplary of these (Cloitre et al., 2011). It is notable that this result is consistent with that of Hyland, Murphy, Shevlin, et al. (2017) suggesting the timing of sexual abuse victimisation to be important as a risk factor for C-PTSD. These results support extant theory and

clinical observations that these experiences appear to be independent risk factors for C-PTSD.

The finding of childhood adversity to act as a risk factor for C-PTSD has further implication for the population under investigation. While C-PTSD may result from military or combat related stressors it could be argued that those with a history of childhood adversity are an increased risk. Indeed, long standing evidence has indicated that service personnel with a history of childhood trauma experience compounded risk for PTSD (Kennedy, 2020). This coupled with evidence previously cited that those in NI are at increased risk for adverse mental health outcomes due to the legacy of the conflict (see Muldoon et al., 2005) suggests it may be prudent to screen for such vulnerabilities in those enlisting in the armed forces in NI.

It should however be noted that childhood adversity was not a ubiquitous predictor of C-PTSD symptoms as a number of adversities investigated did not significantly predict *High C-PTSD* class membership. *Psychological* and *Physical Abuse*, and indicators of *Family and Household Dysfunction* were found to return non-significant results. Previous researchers have found physical abuse histories, childhood and adulthood, to be associated with PTSD more than C-PTSD in community samples suggesting that these may be a less salient risk factor for C-PTSD in non-clinical samples (Ben-Ezra et al., 2018). Further to this, domains of household dysfunction have been demonstrated to be less associated with the likelihood of developing traditional PTSD symptoms than other forms of childhood adversity (see McLaughlin et al., 2017). Together these results support the position that particular ACEs such as Sexual abuse and Neglect may be considered more significant independent predictors of C-PTSD.

It was also found that '*Parental Separation*' was negatively associated with *High C-PTSD* class membership. A *stress relief hypothesis* is proposed in relation to this finding, whereby the stress of parental separation may in fact indicate the net removal of adversity such as a combative or otherwise stressful environment caused by marital discord (Wheaton, 1990). Prior research has supported this assertion indicating that depressive and anxiety symptoms may be reduced by parental separation and divorce (Jekielek, 1998). In this case parental separation may be

argued to be not a childhood adversity, but removal of such, which may benefit mental health outcomes. Conversely, Separation may equally mark the disruption of a nurturing environment and the removal of pro-social resources (Amato, 2010). Amato (2010) notes that many studies hold *Parental Separation* to be an adversity and associated with poorer well-being. Researchers are therefore cautioned against assumptions regarding the nature of experiences to constitute adversity as evaluations of events and lived experience may differ significantly between individuals.

Interestingly, *Emotional Neglect* was associated with the *High C-PTSD* class and the only significant adversity predictor of the *Moderate Symptomatic* class. This may be argued to be indicative of the importance of this dynamic on the development and maintenance of both sub-threshold and severe C-PTSD symptoms. Dorahy et al. (2009) in a study of DESNOS and C-PTSD among conflict-exposed individuals in NI report the significance of childhood emotional abuse and neglect as predictor of complex post-traumatic symptomology. It is argued that the experience of severe neglect may internalise poor affective and relational dynamics which are indicative of C-PTSD DSO symptoms (Dorahy et al., 2009). Similarly, Karatzias et al. (2017) report that *Emotional Neglect* was associated with the largest independent effect on ICD-11 defined C-PTSD pathology of recognised childhood adversities. As such evidence supports that this adversity may be particularly important in the development of C-PTSD. Assessment of adversity and abuse histories are recommended in evaluation of potential C-PTSD cases with explicit consideration given to experience of childhood neglect.

Additionally, while previous studies have indicated the above-mentioned traumatic events and adversities to independently predict C-PTSD as traumatic events and adversities frequently co-occur consideration was also given to the cumulative effects of these experiences;

6.4.2 Cumulative Trauma Predictors

As a central component of the Complex Trauma definition cumulative or poly-traumatisation across the life course was investigated. Results showed that childhood and lifetime cumulative trauma significantly predicted both *Moderate Symptomatic* and *High C-PTSD* class membership. This study finding is consistent with theory driven expectations and prior empirical research previously discussed (Cloitre et al., 2009; Frewen et al., 2019; Hyland, Murphy, et al., 2017). Thus, the contemporary definition of Complex Trauma in its focus on the effects of cumulative stress on the risk for C-PTSD is tentatively supported (Cloitre et al., 2009; Courtois, 2008).

The results reported herein are consistent with those of previous research that have found cumulative childhood, adulthood, and life course stressors to contribute to risk of C-PTSD in a dose-response fashion, i.e. as number of traumatic experiences increases as does the risk for C-PTSD (Hyland, Murphy, et al., 2017; Karatzias, Shevlin, et al., 2017). A possible explanation for this observed relationship is the theory of *Allostatic/Traumatic Load*; where additional types of traumatic or stressful experiences contribute to an overall burden of distress which increases the likelihood of psychopathology such as PTSD (Wilker & Kolassa, 2013). It is believed that such load exerts additive effects on genetic vulnerabilities (Wilker & Kolassa, 2013) and psychological/developmental processes (Cloitre et al., 2009) to the point where clinical distress is manifested. Applied to C-PTSD this mechanistic theory implies that cumulative Traumatic Load, characteristic of Complex Trauma, contributes to psychological and psychosocial difficulties that are manifested by PTSD and DSO symptoms.

Prior research has indicated that exposure to traumatic stress in childhood is a more significant predictor of post-traumatic symptom complexity (Cloitre et al., 2009). Moreover, when followed by multiple stressful exposures in adulthood, childhood cumulative trauma has a significant interactive and additive effect on symptom outcomes (Cloitre et al., 2009). It is possible that beyond cumulative traumatic exposures, the interaction of stressful events is a significant predictor of outcomes.

Conversely, the results of Palic et al. (2016) found that across multiple traumatised groups including CSA survivors, Mental health professionals, refugees, POWs, and

veterans, the timing of exposure and cumulative nature of trauma did not uniformly predict C-PTSD. It was rather concluded that samples exposed to more severe interpersonal trauma regardless of time in their life were more likely to report C-PTSD symptoms. It may therefore be argued that the potential for attachment disruption and maladaptation to continuous trauma are among the most salient factors for manifesting C-PTSD, rather than developmental disturbance. Certain experiences may lead to adaptations in response to contextual stress or a traumagenic environment that, while beneficial in context, become pathological when the stressor is removed (Palic et al., 2016).

It should also be acknowledged that age and educational attainment acted as significant predictors across models in this study. Younger age and lower educational attainment were found to predict both *Moderate Symptomatic* and *High C-PTSD* class memberships suggesting these to be relevant risk factors for the development of C-PTSD symptomatology in the current sample. It is therefore recommended that like trauma-typology or service characteristics, individual demographics might be considered in identifying those potentially at risk for development of C-PTSD symptoms.

In line with this, the variable '*Service in NI*' was examined in this study as a proxy of contextual trauma and threat and found to similarly predict *High C-PTSD* class membership. This finding supports the study hypothesis that military service in NI would be a unique risk factor for C-PTSD. As described in the premise of this research aim, this relationship is speculated to be due to the effects of persistent fear of attack from dissident enemy combatants and traumatic reminders, for instance returning to an area associated with a past traumatic experience (see Armour et al., 2017) arising from living in a post-conflict setting which are argued to comprise Complex Traumatic experiences. This however is rationed in the context of the current study and the nascent research with NI veterans to inform this hypothesis. Caution should therefore be applied in generalisation of this finding beyond the context of the current population to other post-conflict groups.

It should also be noted that while '*Service in NI*' significantly predicted C-PTSD symptomology, the SLESQ item; '*Other Trauma such as Living in a Warzone*' did not. This may be indicative of the differential effects of deployment-related stressful experiences abroad and home service associated with NI; where those deployed to other conflicts such as Iraq and Afghanistan are less likely to experience C-PTSD. Equally, this may be due to participants not perceiving NI as a 'Warzone' and thus not endorsing this item. Future systematic investigation of the effects of different military experiences regarding deployment and home service as they relate to C-PTSD development would be of value to understanding the disorder among military veterans.

Finally, evidence has shown that on-going perceived or actual threat may negatively impact treatment outcomes and are associated with symptom chronicity (Bailey, Trevillion, & Gilchrist, 2019; Fragkaki, Thomaes, & Sijbrandij, 2016). It is suggested that exposure to prolonged threat or traumagenic environments may have a tangible impact on treatment resistance. Given the common antecedent of C-PTSD and treatment resistance it is argued that particular consideration be given to the effects of traumatic experiences on not only symptom development but their course. While interventions for C-PTSD are reasoned to be well informed by best practice applied to traditional PTSD treatment researchers have argued that existing evidence of treatment efficacy derived from sample without complex traumatic experiences should be applied cautiously (Bisson, Roberts, Andrew, Cooper, & Lewis, 2013; Karatzias, Murphy, et al., 2019).

Additionally recent evidence has found in post-conflict settings (NI, Guatemala, and Nepal) that both historic and recent stressful events are predictive of PTSD pathology in conjunction with economic stressors (Eide & Dyrstad, 2019). Results showed historic conflict-related traumatic events across samples remained associated with more elevated odds of PTSD suggesting these experiences remain a risk for adverse mental health outcomes (Eide & Dyrstad, 2019). Despite this, more recent stressful events were more significantly associated with PTSD however when controlling for historic experience of conflict odd were reduced. This tentatively suggests that experience of conflict may increase vulnerability for PTSD following subsequent

stressful life events. This coupled with prior evidence to suggest the threat of violence and reminders of conflict to exacerbate PTSD symptoms (Solomon et al., 2008) highlights the importance of life course assessment of traumatic stress as a risk for psychopathology. These studies however focus exclusively on PTSD symptoms as an outcome. Given the findings of this study it is suggested a similar relationship may be observed for C-PTSD as an outcome. Further research is called for to longitudinally explore the interaction of stressful life events as a risk factor for C-PTSD.

Taken together these results demonstrate a somewhat reliable pattern of trauma predictors of C-PTSD pathology across populations, including NI military veterans. They further support the current proposals that C-PTSD is not necessarily liked to a specific typology of traumatic experience, but rather characteristics of childhood adversity and cumulative trauma pose an increased risk of symptomology (Cloitre et al., 2013; Elklit et al., 2014).

6.4.3 Limitations

These results and the implications thereof should be considered in light of some limitations;

Firstly, a relative strength of this study lies in focus on the influence of traumatic exposure, closely examining the role of this factor in C-PTSD development. However, this approach is limited in its *'monocausal'* inference. Critics of this perspective argue that the range of potential factors which may influence the development of psychopathology is necessarily limited by the focus on a single facet and omitting the complex interactions between genetic, environmental, and experiential factors (Kendler, 2019). Indeed, research has argued the observation of extraneous variables to influence PTSD symptomology undermines the theorised importance of trauma in its causation (North et al., 2009). Likewise, the models specified in this study were found to provide poor fit according to the chi-square test. As such it may be recommended that future investigations may compliment these results by testing

more refined models and analyses examining the extent to which trauma history and personality variables influence post-traumatic symptom development.

The assessment of trauma and stressor exposure also emphasised brevity and was restricted due to the large-scale nature of the survey. As the assessment of traumatic experiences and adversity was not finite the items contained within this investigation may not capture the entire range of potential stressors that may be experienced. While the screening method of assessment used does not allow for the same level of detail regarding traumatic experiences, this method was more appropriate given the design and format of this study.

Secondly, further limitation in the measurement of traumatic experiences should also be acknowledged as information of event qualities (e.g. attribution and evaluation) is lacking. For instance, items on the SLESQ used in the current study are binary indicators of lifetime stressful exposure and therefore events endorsed may occur in childhood or adulthood. It is therefore possible that some number of childhood traumatic experiences remain in this indicator and as such conclusions regarding the predictive power of adulthood traumatic exposure are made tentatively. Furthermore, lack of specific inquiry about the nature of '*Living in a Warzone*' and '*Fire/Explosion*' exposure means these may not be attributed to military experiences with whole confidence and the results of these predictors should be interpreted as such. It is recommended that future investigations make comprehensive inquiry about the nature of traumas, as well as their interaction where multiple are present.

Thirdly, the hypothesis regarding military service in NI to predict C-PTSD symptomology was assessed only by the endorsement of this experience. While supported, this conclusion may be strengthened by systematic measurement of NI conflict-related experiences and examination of their predictive ability on C-PTSD outcomes. Future investigations may seek in include more substantive measurement of combat exposure and conflict related trauma. These data unfortunately did not allow for substantive investigation of this owing to a high amount of missing data on responses to Combat Experiences Scale (>50%). A further consideration for this populations specifically would be administration of the Troubles-Related Experiences Questionnaire (TREQ; Dorahy, Shannon, & Maguire, 2007). The TREQ is a validated

26 item measure of conflict related trauma across the life-course designed for use in NI. Application of this measure represents a unique opportunity to examine the effects of civil conflict and the post-conflict context as a contributor to C-PTSD pathology within NI.

Finally, the current study investigated the likelihood of *High C-PTSD* relative to the resilient class where others have investigated traumatic predictors of C-PTSD relative to a traditional PTSD symptom class (Cloitre et al., 2013; Hyland, Murphy, et al., 2017). A profile of response consistent with PTSD was not identified in the study population (see *Chapter 5.3.3*) and as such equitable comparison was not possible between symptomatic classes. The findings and conclusions herein hence correspond to the ability for traumatic experiences to predict C-PTSD only and not to differentiate between PTSD and C-PTSD.

6.4.4 Conclusions

Despite these limitations, the current study offers a valuable contribution to the investigation of traumatic events as predictors of C-PTSD. The findings presented herein are largely consistent with the extant literature focusing on Complex Trauma as an antecedent to C-PTSD (Brewin et al., 2017). Specifically, experience of trauma and adversity in childhood, and cumulative stressors increase the risk of C-PTSD.

These results highlight the potential role of traumatic events outside of these conditions, such as *Exposure to Fire or Explosions*, to similarly predict greater C-PTSD symptomology. Additionally, this study supported the hypothesis that engaging in domestic military service in NI is associated with C-PTSD pathology. This finding supports the utility of a broad definition of Complex Trauma as a predictor of C-PTSD, that certain traumatic events may act as risk factors for C-PTSD, however the condition does not necessitate a prescriptive trauma history (Cloitre et al., 2013; Courtois, 2008). This work should prompt consideration and further inquiry into the effects of trauma and stressful experience typology and chronicity on C-PTSD in different populations and contexts.

Chapter 7.0;
Latent Class Analysis of ICD-11 C-PTSD Psychiatric Comorbidity Among Military Veterans in Northern Ireland

7.1 Introduction

Mental health difficulties have been found to be a serious concern is post-conflict societies with notably high prevalence rates of depression, anxiety and PTSD compared to global means (Charlson et al., 2019). Research also indicates that the incidence of psychiatric comorbidity is comparatively high in these settings, with 13.0% estimated to experience at least mild psychiatric comorbidity (Charlson et al., 2019). Additionally, those exposed to conflict-related trauma in NI have been also found to be at increased risk of suicidal ideation (O'Neill et al., 2014). O'Neill et al. (2014) also found those experiencing a current mental health disorder to be at further increased risk of suicidal thoughts and behaviours. It is therefore suggested that trauma and stressors might contribute to many forms of psychiatric distress.

PTSD has historically been regarded as highly co-morbid with anxiety and mood disorders (Galatzer-Levy, Nickerson, Litz, & Marmar, 2013; Kinzie, Jaranson, & Kroupin, 2007). Indeed, epidemiological evidence suggests at around half of those who experience PTSD are likely to report comorbid depression (Pietrzak, Goldstein, Southwick, & Grant, 2012), and 40% likely to meet criteria for comorbid Generalised Anxiety Disorder (GAD) (Milanak, Gros, Magruder, Brawman-Mintzer, & Frueh, 2013). Research has additionally shown that comorbid presentation with anxiety and depression is more common than PTSD diagnosis alone (Ginzburg et al., 2010). This evidence prompts consideration of the potential comorbid nature of C-PTSD due to its similar aetiology. The ICD-11 revision of PTSD and C-PTSD was made in part with the goal of reducing comorbid statistics, and to accurately quantify specific post-traumatic syndromes (Brewin, 2013; Maercker, Brewin, Bryant, Cloitre, van Ommeren, et al., 2013). Preliminary investigations of the efficacy of this have however undermined this.

Research has indicated that C-PTSD is highly comorbid with other mental health disorders in the same vein as PTSD diagnosis (Karatzias, Hyland, et al., 2019; Powers et al., 2017). It has been shown that C-PTSD cases were significantly more likely to experience comorbid depression, alcohol and substance use disorders when

compared to DSM-5 PTSD cases and trauma-exposed controls (Powers et al., 2017). Likewise, Karatzias et al. (2019) found ICD-11 C-PTSD diagnosis to be associated with significantly greater likelihood of comorbid mental health issues compared to PTSD diagnosis. It is speculated that this relationship may be driven by the DSO facets of C-PTSD. For instance, Emotional Dysregulation may place individuals at greater risk of a number of other disorders as a shared symptom. Comorbidity theories posit that overlapping symptoms of various disorders '*bridge*' diagnoses leading one to experience another related cluster of symptoms (Cramer, Waldorp, van der Maas, & Borsboom, 2010). It is hence considered in this investigation that aspects of DSO constitute common symptomology with other disorders; namely *Generalised Anxiety* (GAD) and *Major Depressive Disorder* (MDD).

In line with the goals of this thesis and the considerations introduced above this section considers the extant evidence for psychiatric comorbidity in relation to traditional PTSD diagnosis, and to ICD-11 C-PTSD;

7.1.1 PTSD and Psychiatric Comorbidity

As introduced, PTSD is associated with a number of other psychiatric comorbidities. Among the most commonly reported comorbid diagnoses and conditions in veteran populations with PTSD are *GAD*, *MDD*, and *Suicidality* (i.e. suicidal ideation and attempt) (Ginzburg et al., 2010; Krysinska & Lester, 2010).

Firstly considered is relationship between PTSD and GAD. GAD has been noted to demonstrate a high degree of conceptual similarity to PTSD due to commonality in symptoms, e.g. irritability, difficulty sleeping, and feeling on edge (M. Price & van Stolk-Cooke, 2015). In a study of military veterans attending Veteran's Affairs locations in the US it was found that 12% of the sample screened positively for current GAD, and 40% of those with PTSD also concurrently met criteria for GAD (Milanak et al., 2013). Milanak et al. (2013) further noted that those with comorbid PTSD and GAD reported more severe symptomology and greater psychological distress and impairment. These results highlight the relevance of considering the

potential for co-occurring GAD in PTSD cases as this may constitute a more pathologically impaired group.

Indeed, in investigation of ICD-11 PTSD comorbidity Shevlin et al. (2018) note ICD-11 criteria to be associated with greater comorbidity with GAD and concurrent GAD+MDD, while DSM-5 diagnostic criteria was associated mores with comorbid MDD. This finding runs contrary to the goals of reducing comorbidity through the ICD-11 revision but is suggested to highlight the relationship between the reduced ICD-11 PTSD and anxious disorder comorbidity (Shevlin, Hyland, Vallières, et al., 2018). However, as the work of Shevlin et al. (2018) study focused exclusively on core PTSD diagnosis, omitting C-PTSD, it remains unknown if this diagnosis is similarly related to anxious disorders or to depressive comorbidity.

It should additionally be noted that, like PTSD, GAD is considered highly comorbid with other mental health disorders (Goldstein-Piekarski, Williams, & Humphreys, 2016). Both PTSD and GAD are notably associated with an increased likelihood of experiencing comorbid mood disorders such as MDD (Goldstein-Piekarski et al., 2016).

Similar to GAD, there is noted to be intrinsic symptom overlap between PTSD and MDD pathologies (M. Price & van Stolk-Cooke, 2015). The high co-occurrence of PTSD and other psychopathologies is often ascribed to a conceptual overlap of symptoms, for instance with *affect suppression* and its relation to *depression* (Brady, Killeen, Brewerton, & Lucerini, 2000). This is supported by a factor analytic study from Gros, Simms, and Acierno (2010) which showed PTSD dysphoria and numbing symptoms to load on to the identified '*Depression*' factor. This study further noted that these symptoms predicted severity of MDD symptomology among those with PTSD, and diagnostic comorbidity (Gros et al., 2010).

An alternative to the symptom overlap hypothesis between PTSD and MDD is proposed by Flory and Yehuda (2015) in a *distinct phenotype* hypothesis. This perspective drawing on literature concerning psychological and biological differences

between PTSD-only and PTSD-MDD cases argues that those with comorbid PTSD and MDD may be better thought of as experiencing an internalising sub-type of PTSD (Flory & Yehuda, 2015). This is supported by findings of factor analysis among trauma-exposed military veterans finding PTSD and MDD, with Alcohol Use Disorder, to load on a common *Anxiety-Misery* factor (M. W. Miller, Fogler, Wolf, Kaloupek, & Keane, 2008). It is noted however that GAD was not examined within this study, however other anxious disorders, Panic Disorder and Obsessive-Compulsive Disorder loaded on to a separate *Fear* factor suggesting anxiety to be distinguished from PTSD and MDD.

However, GAD and MDD are found to be frequently comorbid (Moffitt et al., 2007) and this is similarly the case among those with concurrent PTSD (Contractor et al., 2015; Ginzburg et al., 2010). Notably, Ginzburg et al. (2010) report that among combat-exposed military veterans triple comorbidity (i.e. concurrent caseness for PTSD, GAD, and MDD) was more prevalent than the presence of PTSD alone or single comorbidity. Likewise, the work of Contractor et al. (2015) examining profile of comorbidity symptoms found PTSD, GAD and MDD symptoms to be associated with homogenous patterns differentiated by symptom severity, meaning that where PTSD severity was high so were GAD and MDD. These results suggest that PTSD, MDD, and GAD are commonly linked and share aspects of morbidity.

Further to this, PTSD has also been linked to heightened risk for suicidality. Evidence from a systematic review demonstrates that there is an independent relationship between PTSD and risk of suicidal ideation and attempt (Krysinska & Lester, 2010). This conclusion is consistent with findings from a study of the comorbid nature of PTSD assessed using a nationally representative US sample of over 34,000 participants (Pietrzak et al., 2012). These results supported significantly elevated rates of comorbidities associated with PTSD for the above-mentioned psychopathologies (GAD, and MDD) in addition to *suicidality,* specifically suicide attempts (Pietrzak et al., 2012). In the review provided by Krysinska and Lester (2010) it was additionally noted that while PTSD was independently linked to suicidality,

emergent patterns suggested that comorbid anxiety and depression with PTSD further increased the likelihood of reporting suicidal ideation and attempts.

This is consistent with findings among veterans with comorbid PTSD and depressive disorders where suicidality is found to be a pressing issue, with as many as 49% of such cases endorsing suicidal ideation (Arenson et al., 2018). No extraneous psychosocial variables were found to account for the elevated risk of suicidal ideation in this study suggesting the direct influence of these symptoms on the risk for suicidality (Arenson et al., 2018). Additionally, among military veterans with MDD, experiencing a comorbid anxiety disorder including GAD has been found to significantly increase the risk of suicidal ideation and completion (Pfeiffer, Ganoczy, Ilgen, Zivin, & Valenstein, 2009).

It is therefore demonstrated that traditional PTSD diagnosis is associated with several, often multiply, comorbid conditions. Is such cases the complexity and chronicity of PTSD is linked to an increased likelihood of experiencing multiple comorbid difficulties and greater functional impairment (Contractor et al., 2015; Galatzer-Levy et al., 2013). C-PTSD is argued to be a more chronic condition that its traditional counterpart (Karatzias, Hyland, et al., 2019), and associated with greater functional impairment and elaborate symptom complexity (Karatzias, Shevlin, et al., 2017). It is thus argued this condition may be associated with similar or greater risk for diagnostic comorbidity.

Indeed, the symptoms of PTSD diagnosis outside of core re-experiencing, avoidance and hyperarousal typical of anxiety and depressive disorders were removed in an effort to reduce diagnostic comorbidity (Brewin et al., 2017; Maercker, Brewin, Bryant, Cloitre, van Ommeren, et al., 2013). These cognate symptoms, i.e. Difficulties with Sleep, Irritability, and Negative Affect, are all exampled as common symptom criteria included for both DSM-5 PTSD, MDD and GAD (Brewin et al., 2017). It is thought that these shared symptoms may serve to inflate estimates of comorbidity due to overlapping endorsement (Brewin et al., 2017). The removal of these and narrowing of ICD-11 PTSD was hoped to reduce diagnostic comorbidity (Maercker,

Brewin, Bryant, Cloitre, Reed, et al., 2013). This may however neglect to recognise the implications for C-PTSD as these common symptoms remain present in DSO domains.

As such the following section will consider the effects that the additional ICD-11 C-PTSD symptoms may contribute to these common comorbidities;

7.1.2 C-PTSD and Psychiatric Comorbidity

As stated, the shared symptomology between traditional PTSD and C-PTSD suggests that this diagnosis may exhibit similar patterns of comorbidity. The non-specific symptoms considered problematic and removed from ICD-11 PTSD criteria in the quest to reduce comorbidity (Maercker, Brewin, Bryant, Cloitre, van Ommeren, et al., 2013) may be argued to be ineffective for C-PTSD. Those symptoms described as non-specific may be argued to now feature in the C-PTSD *DSO* domains; *Affect Dysregulation* (AD), *Negative Self-Concept* (NSC), and *Disturbed Relationships* (DR). It is argued that these symptoms may contribute additive risk for the same comorbidities previously discussed for those with C-PTSD due to similarity with symptom criteria for other disorders (Sar, 2011). Evidence for the independent association between these symptom domains and *GAD*, *MDD*, and *Suicidality* is presented below;

Firstly considered is the AD symptom domain. Previous research has independently linked poor affective regulation to the development of common psychopathology (Hofmann, Sawyer, Fang, & Asnaani, 2012). In fact this construct has been posited to be central to the development of mood and anxiety disorders such as MDD and GAD through a *Diathesis-Stress model* (Hofmann et al., 2012). This theory proposes that reaction to an environmental stressor where an individual possess a vulnerability, such as poor or maladaptive affective style, lead to an adverse pathological state (Hofmann et al., 2012). In this case it may be argued that traumatic exposure associated with C-PTSD may additionally increase the risk for subsequent mood and anxiety disorders via AD, and thus increase comorbidity of these conditions.

Further to this, AD and PTSD symptoms have been demonstrated to independently be associated with externalising behaviours and suicidality (Briere, Hodges, & Godbout, 2010). Briere et al. (2010) found PTSD and AD difficulties to mediate the relationship between severe traumatic exposure and *dysfunctional avoidance*; suicidality, self-injury, antisocial or reckless behaviour, and sexual dysfunction. It is therefore argued that the experience of psychological distress from PTSD symptoms combined with a diminished capacity to regulate one's emotions leads to problematic behaviours (Briere et al., 2010). Such diminished emotion regulation capacity, i.e. the perceived in ability to withstand adverse feelings, has likewise been shown to mediate the relationship between traumatic exposure and internalising pathologies such as MDD and GAD (Robinson et al., 2019). These findings highlight the potential mechanistic role of AD in the manifestation of both internalising and externalising comorbidities. A review offered by Messman-Moore and Bhuptani (2017) suggests emotional dysregulation following childhood trauma exposure may act as a consolidating factor linking PTSD and other serious psychological symptoms and conditions. This review similarly suggests a mechanistic role of emotional dysregulation, whereby traumatic experience diminishes AD capacities which in turn contributes to pathological distress (Messman-Moore & Bhuptani, 2017). As such those with C-PTSD, where AD is a central feature, may be at heightened risk of a number of comorbid difficulties.

Secondly considered is the risk for comorbidity conferred by NSC symptom domain. These symptoms characterised by feelings of worthlessness or of one being a failure (Cloitre et al., 2018) may be considered risk factors for the comorbidities under investigation. Perhaps most relevant is the link between negative self-cognitions and MDD. This is described in *Beck's Cognitive Theory of Depression*; where negative beliefs about the self, the world, and the future lead to a negative cognitive and affective state indicative of major depression (Beck, 1967; Beck & Alford, 2009). This theory additionally posits that intense and pervasive negative beliefs can lead to a yearning for escape manifesting in suicidal ideation and behaviours (Beck & Alford, 2009).

Negative cognitions about one's self and the world are similarly found in diagnostic criteria for GAD, such as belief that one must perform flawlessly and meet all expectations and requirements of them (Koerner, Tallon, & Kusec, 2015). Indeed, the results of Koerner et al. (2015) support this showing that negative beliefs about the self significantly predicted probable GAD caseness, and GAD symptom severity. Indeed, research has also indicated that GAD is differentiated from other anxiety disorders by the presence of negative cognitions about one's self and social roles (Wells & Carter, 2001). It is therefore argued that specific NSC symptoms concerning feeling like a failure or worthless would be positively associated with GAD diagnostic status.

It is argued that persistent negative self-beliefs may form a negative cognitive schema that contributes to pathological depressive and anxiety symptoms (Koerner et al., 2015). Consistent with this, Dorahy et al. (2013) notes that negative self-esteems and self-attack cognitions may arise as maladaptive responses to Complex Trauma experiences. These maladaptive responses are then thought to contribute to a greater sense of shame and post-traumatic pathology, including comorbid diagnoses and relational difficulties (Dorahy et al., 2017, 2013). The effects of Complex Trauma described by Dorahy et al. (2013) may also be understood through the mechanisms previously explored; the formation of persistent negative cognitions leading to MDD (Beck & Alford, 2009), and maladaptive cognitions and beliefs leading to GAD symptoms (Koerner et al., 2015). As such the NSC domain and Complex Trauma exposure may both contribute to the risk of comorbidity.

Finally reviewed is the potential for DR symptoms to influence psychiatric comorbidity with C-PTSD diagnosis. This construct is measured through indicators of relationship difficulties specifically; a) feeling distant from others, and b) finding it hard to maintain meaningful relationships (Cloitre et al., 2018). Evidence has supported that interpersonal difficulties and insecure relationship attachment are significant predictors of psychological morbidity, with perceived poor relations

associated with an increased risk for disorders such as MDD and GAD (Mikulincer & Shaver, 2012).

Further to this, this same symptom found within the NACM cluster of DSM-5 PTSD (*Feeling Distant or Cut-off from Others*) has been found to significantly predict greater symptom-related and relationship functional impairment reported by participant in a causative role (Frewen, Allen, Lanius, & Neufeld, 2012). These symptoms may therefore be considered indicators of poor perceived social support, a risk factor well established to increase the likelihood of experiencing a broad range of psychopathology and behavioural issues (Lakey & Orehek, 2011).

These assertions appear to be supported by a recent investigation into comorbid associations with C-PTSD in a representative UK general population finding that among those meeting C-PTSD diagnostic criteria the majority also met criteria for GAD (86%), MDD (89%), or suicide attempt or self-harm (57.1%) (Karatzias, Hyland, et al., 2019). Moreover, C-PTSD diagnostic status was considered a significant risk factor for these comorbidities, associated with over 20 times greater odds of meeting criteria for GAD and MDD, and 3 times greater likelihood of endorsing suicidality (Karatzias, Hyland, et al., 2019). The authors additionally note that C-PTSD was associated with greater comorbidity than diagnosis of traditional PTSD in this investigation (Karatzias, Hyland, et al., 2019).

Together these results suggest that the additional symptoms contained within C-PTSD criteria may contribute additive risk for the same psychopathologies commonly reported with traditional PTSD diagnosis. The majority of current evidence is offered for this in terms of associative comorbidity studies using regression analyses. However, given that multiple comorbidity is also noted to be prevalent with traditional PTSD (Ginzburg et al., 2010) there is a need to consider both comorbid associations and patterns with C-PTSD. An effective method of examining this is the application of latent class models. This methodology has previously been used to investigate traditional PTSD comorbidity patterns (Contractor et al., 2015; Galatzer-Levy et al., 2013).

7.1.3 Patterns of PTSD Comorbidity

As noted, there is evidence to support the rationale that C-PTSD is related to several psychiatric conditions through the DSO symptoms. It is therefore argued that the similarity between traditional PTSD and C-PTSD, coupled with the additive risk from DSO symptoms, represent a risk for similar comorbidities. As there is currently a lack of empirical evidence regarding C-PTSD comorbidity extant literature concerning patterns of traditional PTSD comorbidity is considered;

Contractor et al. (2015) and Jongedijk, van der Aa, Haagen, Boelen, and Kleber (2019) offer LPA of psychiatric comorbidity with traditional PTSD among trauma exposed service personnel and veterans. Both these studies similarly examine patterns of response to items related to PTSD, MDD, and GAD, with Jongedijk et al. (2019) including indicators of other anxious and psychotic disorders. These studies both supported the application of a three-class model of PTSD comorbidity where classes were differentiated in terms of severity of response; categorised as *Low*, *Moderate*, and *Severe/High* groups (Contractor et al., 2015; Jongedijk et al., 2019). Together these findings support that homogenous patterns of comorbidity exist in relation to PTSD pathology; i.e. the level or severity of distress is replicated across psychopathological domains. This suggests that rather than being associated with a restricted comorbid typology those with severe PTSD may experience a general *poly-morbid* condition; experiencing multiple disorders concurrently (Lippa et al., 2015).

In contrast however, Galatzer-Levy et al. (2013) applied LCA to examine comorbidity profiles associated with lifetime DSM PTSD and a range of DSM defined psychiatric conditions, supporting latent groups indicative of different comorbid typologies. These results specified PTSD comorbidity profiles associated with *anxious/depressive symptoms*, a high comorbid group associated with these same symptoms in addition to *substance dependency*, and a '*low comorbidity*' class. These results, at odds with those previously discussed (Contractor et al., 2015; Jongedijk et al., 2019), suggest that heterogeneous groupings of comorbidity associated with PTSD may exist. It

should additionally be noted that another LPA study conducted by Contractor, Roley-Roberts, Lagdon, and Armour (2017) found heterogeneous patterns of comorbidity with PTSD and MDD symptoms in addition to a high comorbidity class. The heterogeneous classes identified were characterised by High PTSD and Low MDD, and High MDD and Low PTSD symptoms. This finding suggests that, while highly comorbid, these disorders remain distinct and that differential patterns of morbidity exist for sub-groups on these indicators. It remains unknown however to what extent these latent patterns of comorbidity may be associated with the nascent diagnosis of C-PTSD.

Latent variable modelling is considered effective in the study of psychopathology as this technique recognises the complexity of psychological variables and allows for a more 'true to life' representation of their relationship (Cai, 2012). Given the wealth of evidence presented herein to suggest the elements of C-PTSD are positively associated with comorbid psychopathological disorders it is argued that such a sophisticated approach to quantitative investigation of comorbidity is preferable. This overcomes limitations of previous studies noted to examine the independent association of C-PTSD with other psychological disorders (see Karatzias, Hyland, et al., 2019), instead examining the potentiality of C-PTSD co-occurring with multiple disorders simultaneously.

While latent variable modelling has been used to differentiate C-PTSD from potential comorbid diagnoses such as BPD (Cloitre et al., 2014), researchers have not yet applied this method to positively identify patterns of comorbidity consistent to that applied to PTSD (e.g. Galatzer-Levy et al., 2013). Given the contrasting results obtained through examination of latent classes of traditional PTSD comorbidity, rationale is provided to explore to what extent these may apply to latent models of C-PTSD comorbidity.

7.1.4 Study Aims

Taken together, the evidence previously presented in relation to traditional PTSD diagnosis comorbidity suggests that *Anxiety*, *Depression*, and *Suicidality* are relevant considerations (Brady et al., 2000; Galatzer-Levy et al., 2013; Pietrzak et al., 2012). There is evidence to suggest that experience of Complex Trauma and DSO symptoms

associated with C-PTSD may be commonly associated with elevated risk of these comorbidities. A syllogistic argument is therefore proposed where, given the similarity to its counterpart and dependant effects of additional symptoms, C-PTSD caseness is anticipated to be associated with an *increased likelihood* of GAD, MDD, and Suicidality.

The current study seeks to contribute to the growing literature on C-PTSD comorbidity (see Karatzias et al., 2019) by examining the relationship between C-PTSD diagnosis and the above mentioned psychiatric and behaviour conditions, and to address gaps in current understanding by contributing the first latent class examination of C-PTSD and diagnostic comorbidity in a sample of military veterans. Likewise, the application of latent variable modelling allows for more elaborate examination of psychological co-morbidity than the bivariate or independent testing used in previous studies.

It is hypothesised that through examination of latent classes of comorbidity C-PTSD will be associated with similar results to investigations of PTSD comorbidity; identifying a poly-morbid class characterised by high likelihood of endorsing symptoms of both GAD and MDD, as well as indicators of Suicidality.

7.2 Methodology

7.2.1 Measures

PTSD and *C-PTSD* were assessed using the ITQ (Cloitre et al., 2018). The ITQ was only presented in this study if participants endorsed at least one traumatic event and was otherwise removed using skip logic. The procedures for scoring this measure are described previously (see *Chapter 4.2.1*). The ITQ once again shown excellent internal reliability across subscales in this sub-sample; Re-experiencing (α = .931), Avoidance (α = .944), Sense of Threat (α = .904), Affect Dysregulation (α = .879), Negative Self-Concept (α = .968), and Disturbances in Relationships (α = .901).

Depression was assessed using the Patient Health Questionnaire 9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001). The PHQ-9 is considered a valid brief measure of depressive symptoms for clinical assessment and research (Malpass et al., 2016). Items inquire about the frequency of difficulties experienced related to symptoms of Major Depression ranging from 0 'Not at All to 3 'Nearly Every Day' in the past two weeks. This study used a cut-off score of 10 as indicative of probable MDD caseness, a widely applied and validated cut-off (Manea, Gilbody, & McMillan, 2012). The PHQ-9 was shown to possess excellent internal reliability in the current study (α = .955).

Anxiety was similarly assessed using the Generalised Anxiety Disorder questionnaire 7 (GAD-7; Spitzer, Kroenke, Williams, & Löwe, 2006). This 7-item measure is widely used as a screening tool for GAD following a similar format to the PHQ-9. A cut-off score of 10 is considered to provide an adequate sensitivity and specificity to screen for possible caseness of GAD (Spitzer et al., 2006). The GAD-7 was shown to have excellent internal reliability in the current sample (α = .969).

Suicidality was assessed in this investigation using two items adopted from the Ulster Student Wellbeing Study (Bunting et al., 2012). These items specifically assessed *Lifetime Suicidal Ideation* (*Did you ever in your live have thoughts of killing yourself?*)

and *Lifetime Suicide Attempt* (*Have you ever made a suicide attempt (i.e., purposefully hurt yourself with at least some intent to die)?*). Both items allowed a binary, Yes/No, response. Suicidal ideation and attempt are considered precursors of completed suicide, and robust indicators of suicidality (Klonsky, May, & Saffer, 2016).

7.2.2 Procedure

A total of *N* = 903 cases were generated by the online survey. Of these *n* = 319 (35.3%) responses failed to provide consent or proceed to the survey instrument, and a further *n* = 180 participants were found to have endorsed no traumatic experiences (*n* = 30) or were not presented questions related to psychological health providing no responses on study variables (*n* = 150) and were additionally removed from analyses yielding a partially complete dataset of *n* = 404 participants.

Remaining partial missing data were assessed for missingness and analyses supported assuming data to be MCAR (Little's MCAR Test; $\chi 2(408, n = 404) = 443.433$, $p = .061$). Cases with excess of 20% partial missing data were removed (*n* = 59) and the EM algorithm approach was used to impute remaining missing values. This data preparation procedure produced a final study sample of *N* = 345. Data on primary study variables were found to be non-normally distributed, thus the included and excluded groups were compared using the Mann-Whitney U test for ordinal variables and Chi-square test of independence for binary variables (see Appendix 3.4). Results showed no significant difference in included vs. excluded cases with the exception of two items on the PHQ (7 & 9) and endorsement of suicidal ideation. These interestingly these correspond to thoughts of suicide or thinking one would be 'better off dead'. It is possible these questions were more difficult to answer and more frequently skipped by participants.

7.2.3 Participants

Demographic information for the current study sample consistent with those reported in previous studies in this thesis is presented in *Table 7.1* below.

Table 7.1; Chapter Seven Participant Demographic Information, N = 345

Variable	***n* (%)**
Gender/Sex	
Male	308 (89.3)
Female	37 (10.7)
Relationship Status	
Single/Never Married	20 (5.8)
Married/Co-Habiting	252 (73.0)
Engaged	1 (0.3)
Separated/Divorced	60 (17.4)
Widowed	12 (3.5)
Education	
No Qualifications	53 (15.4)
GCSE*	94 (27.3)
A Level*	32 (9.3)
Higher Ed Diploma*	61 (17.7)
Bachelor's Degree*	43 (12.5)
Post-graduate or Doctoral Degree*	46 (13.3)
Other Professional Qualification	15 (4.3)
Branch	
RAF	17 (4.9)
Royal Marine	7 (2.0)
Army	290 (84.1)
Royal Navy	31 (9.0)
Rank	
Officer	75 (21.7)
NCO	180 (52.2)
Other rank (Non-commissioned)	90 (26.1)
Time in service (Regular)	
Never	30 (8.7)
Less than One Year	2 (0.6)
Up to 10 years	117 (33.9)
11-20 Years	99 (28.7)
21+ Years	94 (27.2)
Refused/Missing	3 (0.9)
Time in service (Reserve)	
Never	145 (42.0)
Less than One Year	13 (3.8)
Up to 10 years	118 (34.2)
11-20 Years	27 (7.8)
21+ Years	23 (6.7)
Refused/Missing	19 (5.5)
Current reservist	
Yes	34 (9.9)
No	311 (90.1)
Service in Northern Ireland	
Yes	170 (49.3)
No	174 (50.6)
Refuse	1 (0.3)

*Note: * = or equivalent qualification.*

The majority of participants were found to be male (89.3%), to have served in the Army (84.1%), and achieved a highest rank of Non-Commissioned Officer (52.2%).

The majority had served in some capacity in the regular forces (91.3%) and just under half had served in the home services (49.3%). The mean age of participants in this study was 54.79 (Range = 27 – 86, *SD* = 11.21).

7.2.4 Data Analytic Plan

The goal of this analysis was to examine the diagnostic comorbidity of C-PTSD with other common psychiatric conditions. Associations and latent patterns of psychiatric comorbidity related to the above-mentioned instances of mental ill-health (C-PTSD, Anxiety, Depression) and Suicidal behaviours.

The association or relationship between probable ICD-11 C-PTSD caseness and the other indicators of mental ill-health was examined using *Binary Logistic Regression*. This form of regression involves the examination the relationship between an independent predictor variable on a dichotomous dependant variable or outcome. The result of this statistical test is an *Odds Ratio* (OR). This statistic indicates likelihood of change in the outcome variable given the change in the independent variable, e.g. the increase in likelihood of diagnosis given the presence of a certain condition (Szumilas, 2010). In this study the OR corresponds to the change in likelihood of experiencing the subject disorder in the presence of positive screening for C-PTSD diagnosis.

In this study *Latent Class Analysis* (LCA) was also applied to examine the potential poly-morbid relationship between mental health disorders under investigation. Similar to the concept of LPA (see *Chapter 5.1.2*), LCA involves the imputation of latent or unobserved variables however this method uses *categorical* or *dichotomous variables* to estimate latent groups within data (Hagenaars & McCutcheon, 2002). This latent variable is used as a data reduction technique to group and explain differentiated classes of discrete observations.

The aim of this approach in this investigation is to identify statistically distinct groupings of psychological comorbidity in relation to PTSD and C-PTSD. This statistical technique is an established practice in the study of psychological morbidity and comorbidity epidemiologically (see Galatzer-Levy et al., 2013; P.F. Sullivan, Kessler, &

Kendler, 1998). Model estimations were performed in Mplus 7.3.1 using 10 optimisations of 100 random starts (L. K. Muthén & Muthén, 2015), and using the MLR estimator to generate model fit indices. These indices are assessed using the same procedures and guidelines described previously in relation to LPA (see *Chapter 5.3.1*). Use of the MLR estimator has been demonstrated to perform adequately with non-normal and ordinal missing data (Suh, 2015).

7.3 Results

7.3.1 Psychiatric Morbidity and Co-Morbidity with C-PTSD

The prevalence of psychiatric caseness for each condition under investigation was calculated using the methods previously described, and C-PTSD diagnostic status was examined as a predictor of these. The chi-square of model fit suggested this model to provide a poor fit to these data ($\chi 2$ (4, n = 336) = 165.048, p < .001). As noted previously, this should not necessarily lead to model rejection as the chi-square test is sensitive to larger sample sizes (Tanaka, 1987). This model was found to account for 39% of the variance in psychological diagnostics (Cox & Snell R^2 = .388). Prevalence of each condition and relationship to probably C-PTSD diagnosis is reported in Table 7.2 below;

Table 7.2; Prevalence of Mental Ill-Health and Comorbidity with ICD-11 C-PTSD Caseness

	Prevalence *n* (%)	Comorbidity with C-PTSD OR (95% CI)
Psychiatric Caseness		
PTSD	24 (7.0)	-
C-PTSD	88 (25.5)	-
GAD	124 (35.9)	31.227*** (15.431 - 63.395)
MDD	148 (42.9)	27.794*** (12.768 - 60.500)
Suicidal Ideation	186 (53.9)	9.440*** (4.789 - 18.608)
Suicide Attempt	61 (17.7)	7.732*** (4.239 - 14.105)

*Note: * = p < .050, ** = p < .010, *** = p < .001.*
OR = Odds Ratio, CI = Confidence Interval, PTSD = Post-Traumatic Stress Disorder, GAD = Generalised Anxiety Disorder, MDD = Major Depressive Disorder.

Results showed that mental health disorder caseness was relatively high within the study sample. The majority of participants met criteria for at least one condition or endorsed indicators of suicidality (n = 233, 64.9%). Consistent with findings previously reported in this investigation the incidence of probable C-PTSD caseness was higher than probable ICD-11 PTSD diagnosis, 25.5% vs. 7.0%. The most prevalent conditions were MDD (42.9%) and Lifetime Suicidal Ideation (52.9%). The mean number of conditions criteria positively screened was 1.76 (Range = 0-5, SD = 1.75).

C-PTSD caseness (probable diagnosis) was found to be a significant predictor of all other mental health disorders under investigation. The greatest effects were observed for GAD where probable C-PTSD diagnosis was associated with an increased likelihood of over 31 times (OR = 31.22, 95% CI = 15.43 – 63.40), and MDD where C-PTSD was associated with 27 times greater likelihood of meeting caseness (OR = 27.79, 95% CI = 13.77 – 60.50). The effect of C-PTSD on suicidal ideation and attempt was lower than these, but still associated with a significant increase in probability of these difficulties; over 9 times more likely for Ideation (OR = 9.44, 95% CI = 4.79 – 18.61) and 7 times for attempt (OR = 7.73, 95% CI = 4.24 – 14.11). These odds ratios in relation to comorbidity were noted to be very high. The magnitude of this relationship and implications thereof is specifically discussed in the Discussion section.

Given findings confirming the association between C-PTSD and other aspects of mental ill-health this investigation proceeded to examine if there were statistically identifiable groups present in this sample who differed in comorbidity endorsements.

7.3.2 Model Fit and Selection

Consistent with best practice in latent class estimation a series of models with increasing numbers of classes were applied to these data and assessed for fit (Cloitre et al., 2013). The model number in *Table 7.3* below corresponds to the number of latent classes applied to these data.

Table 7.3; Model Fit Indices of Latent Class Analysis Models of Psychopathological Comorbidity

	Loglikelihood	Best H0 replicated	# param's	AIC	BIC	SSABIC	LMR-LRT (*p*)	Entropy
1	-1055.116	-	5	2120.231	2139.449	2123.587	-	-
2	-808.195	Yes	11	1638.390	1680.669	1645.774	480.146 (.000)	.890
3	-793.230	Yes	17	1620.461	1685.801	1631.872	29.100 (.000)	.836
4	**-779.067**	**Yes**	**23**	**1604.134**	**1692.535**	**1619.573**	**27.542 (.001)**	**.792**
5	-776.622	Yes	29	1611.243	1722.706	1630.710	4.755 (.165)	.857
6	-774.526	Yes	35	1619.052	1753.576	1642.546	4.075 (.047)	.851

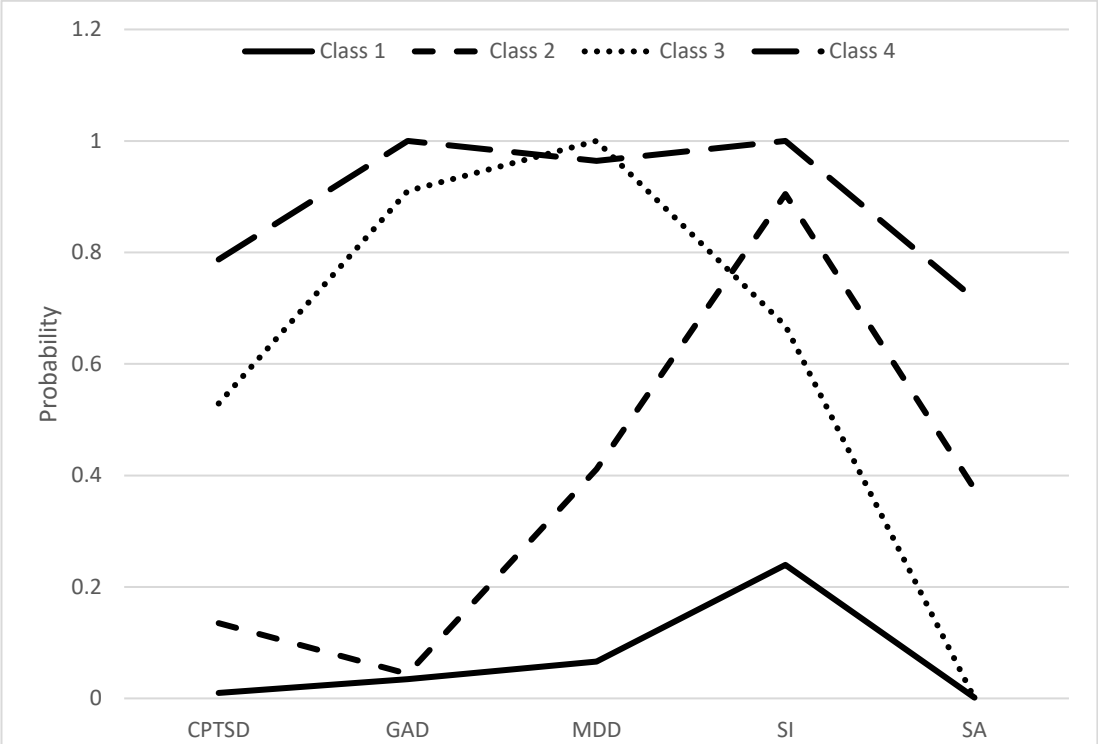
Note: # param's = Number of parameters, AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, SSABIC = Sample-Size Adjusted BIC, LMR-LRT = Lo–Mendell–Rubin test.
** Supported model highlighted in **bold**.*

The four-class solution returned the most favourable AIC and SSABIC statistics. Additionally, the LMR-LRT for the five-class solution indicated that the increase in number of classes beyond four did not improve fit over the previous model (Nylund et al., 2007). Guided by interpretation of the sum of fit indices, and by principles of parsimony and interpretability of the classes produced (L. M. Collins & Lanza, 2009), the *four-class solution* was selected as the most meaningful and best fitting model for these data.

7.3.3 Model Plot

Following selection of the four-class solution the resultant latent variable model was used to produce a plot of probability of endorsement on each indicator. This is shown in *Figure 7.1*;

Figure 7.1; Latent Class Plot and Probability for Caseness for Disorders and Suicidality



	C-PTSD	GAD	MDD	SI	SA
Class 1	0.01	0.04	0.06	0.24	0.00
Class 2	0.14	0.05	0.42	0.90	0.39
Class 3	0.50	0.90	1.00	0.68	0.00
Class 4	0.82	1.00	0.96	1.00	0.71

Note: C-PTSD = Complex Post-Traumatic Stress Disorder, GAD = Generalised Anxiety Disorder, MDD = Major Depressive Disorder, SI = Suicidal Ideation, SA = Suicide Attempt.

The first class, *Class 1; Resilient/Low Comorbidity*, was found not be the largest comprising 55.4% (*n* = 191) of the total sample. This class was characterised by low probabilities of caseness for all morbidities in the current study.

The second class identified was *Class 2; Moderate Suicidal* and was representative of 9.6% (*n* = 33) of the current sample. This class was observed to have low likelihood of meeting caseness for C-PTSD and GAD, and moderate probability of meeting criteria

for MDD. This class was characterised by markedly high probability of endorsing suicidal ideation and moderate probability of endorsing suicide attempt.

The third class; *Class 3; Depressed-Anxious* was representative of 22.3% (*n* = 77) of the study population. This class was associated with high probabilities of screening positively for GAD and MDD, and with moderate probability of screening positive for C-PTSD and moderate to high probability of endorsing suicidal ideation.

The final class; *Class 4; High Comorbidity* was illustrative of 12.8% (*n* = 44) of the study sample. This class was observed to have high probability of cases for all mental health disorders (*C-PTSD*, *GAD*, and *MDD*) and indicators of suicidality (*Ideation* and *Attempt*).

7.4 Discussion

This study endeavoured to examine associations and patterns of psychiatric comorbidity associated with C-PTSD amongst NI military veterans. Consistent with expectations C-PTSD was found to be positively and significantly associated with GAD and MDD diagnoses, and Suicidality. This finding supported the study hypothesis that, like traditional PTSD diagnosis, ICD-11 C-PTSD is associated with an increased risk of psychiatric comorbidity. Given this finding, comorbidity was further analysed using LCA to examine potential patterns of diagnostic co-occurrence. The results of this phase supported a four-class solution with heterogeneous classes of comorbidity labelled; *Resilient*, *Moderate Suicidal*, *Depressed-Anxious*, and *High Comorbidity*. Endorsement of C-PTSD was found to be highly likely in the *High Comorbidity*, and moderately likely in *Depressed-Anxious* groups supporting the hypothesis of this condition to be associated with poly-morbidity. These results in relation to comorbid associations and classes and the implications thereof are considered and discussed in the following sub-sections;

7.4.1 Psychiatric Morbidity and Associative Comorbidity with C-PTSD

The prevalence rates for the psychiatric morbidities under investigation found were notably elevated relative to those reported previously in a trauma-exposed sample of the UK general population (Karatzias, Hyland, et al., 2019). Karatzias et al. (2019) report a prevalence of 12.9% for C-PTSD, 28.5% for GAD, 35% for MDD, and 31.3% for lifetime suicide attempt. Comparatively in the current study prevalence of psychiatric morbidity was; 25.5% for C-PTSD, 35.9% for GAD, 42.9% for MDD, and 53.9% and 17.7% for suicidal ideation and attempt respectively. It is however noted that these studies similarly report the prevalence of ICD-11 C-PTSD to be higher than PTSD diagnosis (Karatzias, Hyland, et al., 2019).

A possible explanation for the comparatively high diagnostic prevalence observed may lay in the sample characteristics in the current study. Prior research has indicated that the prevalence of mental health disorders in post-conflict societies may be significantly elevated (Charlson et al., 2019). This is illustrated by findings from post-

conflict Cambodian and Colombian samples of probable GAD diagnosis of 30% and 59.2% respectively, and probable MDD diagnosis of 30% and 67.8% respectively (Stammel, Abbing, Heeke, & Knaevelsrud, 2015). It is argued that post-conflict contexts pose a unique risk for greater prevalence of mental health disorders through multiple stressors and factors (Charlson et al., 2019). Indeed, research has indicated greater exposure and proximity to conflict in NI increases the risk of adverse mental health outcomes (Muldoon et al., 2005). It is therefore suggested that the post-conflict context and potential experience of conflict-related stressors may confer additional risk for common mental disorders in this sample.

Moreover, NI has recently been reported to have the highest rates of suicidal behaviour in the UK (Simms & Scowcrof, 2018). This may once again be owed in part to the experience of conflict in the region. O'Neill et al. (2014) reported suicidal ideation and attempt to be significantly associated with exposure to stressful life events. This was particularly true of conflict-related traumas in NI with 14.2% and 3.8% of those endorsing exposure to 'The Troubles' reporting suicidal ideation and attempt respectively (O'Neill et al., 2014). Given almost half of the participants in the current study reported serving in NI, and thus likely to be exposed to conflict-related traumatic event in their role, these findings may generalise to explain the high prevalence of suicidality in the current sample.

With regards to comorbidity of these diagnoses with C-PTSD, it was found that probable C-PTSD diagnosis was associated with an increased risk of caseness for all indicators of comorbidity. C-PTSD caseness was associated with alarmingly increased likelihood of probable GAD and MDD diagnosis; 31.2 times and 27.9 times respectively. These results are broadly comparable to that of Karatzias et al. (2019) reporting that C-PTSD caseness increased the probability of screening positive for GAD by 24.6 times, and MDD by 21.8 times. It should additionally be noted that Karatzias et al. (2019) found core PTSD diagnosis to be positively associated with MDD and suicidality however these effects were of a significantly reduced magnitude compared to those found with C-PTSD. Unfortunately, more direct comparison of

PTSD and C-PTSD is not made in the current study owing to the small number of cases satisfying this criterion (*n* = 27, 7.0%). The use of rare predictors has the potential to greatly bias the results of logistic regression analyses (King & Zeng, 2001), as such it was considered of little value to examine PTSD as a predictor of comorbidity in the current study.

Despite this, the strength of association between C-PTSD and other morbidities indicates the severity of comorbidity with this disorder. It may be argued the DSO symptoms and their commonality to other psychiatric symptoms serve to increase the comorbidity between these conditions. These shared or 'bridge' symptoms discussed previously may link diagnoses leading to the experience of multiple clusters of symptoms (Cramer et al., 2010). This may partially explain the strength of association between C-PTSD, GAD, and MDD diagnoses. Additional research is however needed to test this mechanistic hypothesis more directly by examining the relationship between PTSD, DSO, and other psychiatric symptoms.

C-PTSD caseness was also found to increase the likelihood of reported suicidal ideation and attempt in the current study by over 9 times and 7 times respectively. The magnitude of effects reported herein is noted to be higher than that reported previously; 3.43 times (Karatzias, Hyland, et al., 2019). This discrepancy may be attributed to measurement effects as Karatzias et al. (2019) measured suicidality through *Suicide Attempt* and *Self Harm*, where the current study used *Suicide Attempt* and *Ideation* as indicators. The size of this effect may be due to common aetiology or risk for C-PTSD and Suicidality. As previously discussed exposure to conflict-related trauma is positively associated with suicidality (O'Neill et al., 2014), while also service in NI has been evidenced to be a risk factor for C-PTSD (see *Chapter 6.3.2*). These relationships tentatively suggest that the experience of conflict in NI may contribute both to C-PTSD and Suicidality, thus potentially producing a greater association between these outcomes in the current analyses.

The substantial risk that C-PTSD caseness appears to confer on the likelihood of caseness for GAD, MDD and Suicidality has significant implications for assessment

and treatment of this group. These findings highlight the importance of accurate assessment of post-traumatic diagnosis as the high comorbidity prevalence of C-PTSD relative to traditional PTSD should be acknowledged in case formulation and treatment planning (Karatzias, Hyland, et al., 2019). Furthermore, it is suggested that given the high degree of association between C-PTSD diagnosis and other psychiatric comorbidities there is a need to engage in comprehensive symptom assessment where C-PTSD diagnosis is suspected as a number of other symptoms and disorders are likely to be present. Furthermore, it is suggested that clinical assessment among veterans who formerly served in NI should involve examination of multiple morbidities as this group may be at heightened risk for several mental health disorders. The ubiquitous nature of C-PTSD comorbidity across diagnostic categories and indicators of Suicidality prompt consideration of the possible presence of poly-morbid groups.

7.4.2 Classes of Psychiatric Comorbidity

Given the substantiation of the hypothesis of increased risk for comorbidity associated with C-PTSD latent classes of comorbidity were examined. These data supported the differentiation of four groups based on psychiatric comorbidity; a *Resilient* class, *Moderate Suicidal*, *Depressed-Anxious,* and *High Comorbidity* classes. Similar to comorbidity investigations of traditional PTSD diagnosis (Galatzer-Levy et al., 2013), these results showed C-PTSD pathology was not likely to occur in isolation. Of the three symptomatic classes, two were associated with C-PTSD caseness with moderate (*Depressed-Anxious*) and high (*High Comorbidity*) likelihood. These results largely support the second study hypothesis; that C-PTSD would be associated with multiple concurrent disorders. It should however be noted that C-PTSD was not unambiguously associated with other morbidities, thus the symptomatic classes identified are analysed and discussed as they relate to C-PTSD caseness;

Firstly considered is the *Moderate Suicidal* class. This class was characterised by high probabilities of *Suicidal Ideation* and *Attempt*, and low probability of meeting probable diagnosis for C-PTSD, GAD, or MDD. This finding was somewhat surprising

as it is robustly evidenced that psychiatric morbidity is associated with an increased risk for suicidality (O'Neill et al., 2014). Indeed researchers have noted that psychiatric morbidity may be associated with over 30 times increased likelihood of suicidal ideation, with current anxiety and depression among the most salient predictors (J.-I. Lee et al., 2010).

Despite this, the presence of Suicidality in the absence of psychological disorder is not unheard of. Ahrens, Linden, Zäske, and Berzewski (2000) report that in primary care settings across WHO participant countries 30.1% of those presenting with suicidal ideation or intent did not satisfy criteria for any psychopathological condition. The authors argue that this represents evidence for suicidality as a distinct concept, considered potentially comorbid but not inextricably linked to mental health pathology as a symptom. Beyond this some have argued against the pathologising of suicidal ideation and intent, arguing instead that this should not be considered a psychological or medical condition but rather may be rational or non-pathological expression of emotion (Sanati, 2009). The finding of suicidality to exist in the absence of recognised psychopathological disorders suggests this to be a unique consideration for a sub-group of NI veterans and is not intrinsically linked to C-PTSD pathology.

Secondly, the *Depressed-Anxious* class identified was associated with high probability of meeting caseness for MDD and GAD, and moderate probability of caseness for C-PTSD and Suicidal Ideation. This finding is consistent with the well-established linking of GAD and MDD comorbid presentation (Moffitt et al., 2007), confirming these disorders to be highly probable in this group. It is additionally noted however that this group also exhibited moderate likelihood of meeting criteria for C-PTSD. This suggests that, alike traditional PTSD diagnosis, C-PTSD may represent a risk for triple-morbidity with both GAD and MDD concurrently (Ginzburg et al., 2010). Moreover, the finding of moderate likelihood of Suicidal Ideation is consistent with prior research to indicate that comorbid mood and anxious disorders increase the potential for suicidal thoughts (O'Neill et al., 2014).

The identification and characteristics of the *Depressed-Anxious* class in the current study is strikingly reminiscent of the work of Galatzer-Levy et al. (2013), similarly finding a class of individuals with traditional PTSD diagnosis with high probabilities of mood and anxious disorders, and suicidal ideation. These results suggest that C-PTSD comorbidity profiles may echo that of traditional PTSD, exhibiting similar patterns of association with other psychiatric conditions.

The final class identified was the *High Comorbidity* class. This class was defined by high probability of meeting diagnostic criteria for all disorders (C-PTSD, GAD, and MDD) and of endorsing both indicators of Suicidality (Ideation and Attempt). This finding supports the second study hypothesis; expecting a poly-morbid group associated with high probability of C-PTSD and all other conditions. This is consistent once again with previous research concerning traditional PTSD diagnostic comorbidity with multiple concurrent disorders (Ginzburg et al., 2010).

The findings supporting a *High Comorbidity* group was consistent with the previously cited work examining latent profiles of comorbidity (Contractor et al., 2015; Jongedijk et al., 2019). This tentatively supports that those with severe symptomology, as is associated with C-PTSD (Brewin et al., 2017; Karatzias, Cloitre, et al., 2017), are likely to report poly-morbidity or experience psychological distress across multiple diagnoses. However, unlike the aforementioned LPA (Contractor et al., 2015; Jongedijk et al., 2019) studies the current investigation examined profiles of post-trauma morbidity absent C-PTSD symptoms. As a result, qualitatively different classes, i.e. *Depressed-Anxious*, and *Moderate Suicidal*, are reported herein in contrast to those previous investigations cited. Together these results imply that C-PTSD may be associated with poly-morbidity, however there are different post-traumatic pathologies present in the NI veteran population absent C-PTSD symptoms.

Given the use of probable diagnostic status as indicators of latent class membership in the current study, these results may not be directly comparable to those using LPA techniques. The other cited investigation to use LCA of traditional PTSD comorbidity similarly reported qualitatively different classes of comorbidity (Galatzer-Levy et al.,

2013). The differences in findings and conclusions of the current study and that of Galatzer-Levy et al. (2013) relative to those using LPA may hence be partially owing to the measurement level of indicators used. The results of Galatzer-Levy et al. (2013) did not support a *High Comorbidity* class as was found in the current study, however qualitatively different groups of comorbidities were similarly reported including a similar *Depressed-Anxious* group. This disparity may be due to the investigation of C-PTSD rather than traditional PTSD indicating that this disorder may be associated with a greater likelihood of poly-morbidity. This assertion appears to be supported as current evidence suggests that C-PTSD is a more debilitating and comorbid condition relative to traditional PTSD diagnosis (Brewin et al., 2017; Karatzias, Hyland, et al., 2019).

The finding of a *High Comorbidity* class combined with the finding supporting moderate likelihood of C-PTSD in the *Depressed-Anxious* class it may be suggested that these comorbidities may be indicative of a more general underlying dimension of psychological distress. This argument is consistent with the Hierarchical Taxonomy of Psychopathology (HiTOP; Kotov et al., 2017), a theoretical approach which contends that psychological symptoms and disorders are symbolic of higher order groupings or '*Spectra*'. The HiTOP theory suggests that PTSD, GAD, MDD and suicidality all exist as components under a superordinate *Internalising* and *Distress* spectra. As a result, diagnostic co- and poly-morbidity between these conditions may be inevitable as the superordinate *Distress* factor drives distress across these diagnostic categories (Shevlin, Hyland, Vallières, et al., 2018). It may therefore be argued that the relative commonality of diagnostic comorbidity for these conditions in symptomatic classes supports a broader, dimensional concept of *Distress* pathology.

Alternatively, the co-occurrence of disorders may be explained by the '*bridge symptom*' hypothesis introduced previously, suggesting common or similar symptoms to drive linkage to other psychiatric disorders (Cramer et al., 2010). Results from network analyses, a statistical technique to examine the interactive relationship

between symptoms, has supported that over-lapping symptoms may be causal factors in comorbidity between conditions; e.g. PTSD and MDD (Afzali et al., 2017), GAD and MDD (Cramer et al., 2010). As such, the highly comorbid nature of C-PTSD observed may be causally driven by commonality or over-lap in symptoms present in DSO domains as previously discussed. Targeting of these common symptoms, such as affective dysregulation and negative self-concept may provide a useful therapeutic intervention as this is shown to be effective for C-PTSD (Karatzias, Shevlin, Hyland, et al., 2018), and may likewise tackle comorbidity between conditions where these symptoms are shared (P. J. Jones, Ma, & McNally, 2019). Further research is however required to test the utility of these dimensional and hierarchical approaches to understanding C-PTSD comorbidity.

7.4.3 Limitations

The findings and assertions discussed should however be consider in light of some notable study limitations;

Firstly, these results are derived from self-report measurement screening of pathology. As such these results pertain specifically to diagnostic comorbidity and do not examine granular associations between psychopathological symptoms. In addition to this, results of meta-analyses of psychiatric screening using self-report screening measures has suggested this method may overestimate disorder prevalence (Charlson et al., 2019). Despite this, the current investigation made use of widely recognised and validated measures of psychological symptoms to increase confidence in measurement. These results should nevertheless be interpreted with caution with regard to morbidity and comorbidity statistics. Future research may consider using clinician evaluation of psychiatric symptoms and morbidity to more accurately assess diagnostic status and co-occurrence.

Secondly, the measurement of pathology was categorical in nature; using probable diagnostic caseness as indicators for analyses. This approach is valuable in discerning diagnostic comorbidity as may be applied in clinical settings, however, is necessarily limited by the loss of information about the interactive relationships between

independent symptoms. While these results provide an initial investigation into C-PTSD comorbidity, they may be complimented and extended by dimensional investigation of symptoms and diagnostic association. A suggested future direction to supplement these results may be to perform a network analysis of the component symptoms of each disorder (C-PTSD, GAD, and MDD). This method may facilitate analysis of the association between potential bridge symptoms, and thus these disorders (Cramer et al., 2010).

Thirdly, due to the cross-sectional design of the current study the temporal order of symptom development and diagnostic caseness cannot be established. While all measures correspond to current psychological distress and consequently the results may be considered indicative of current comorbidity, it remains unknown to what extent diagnostic conditions may exist as pre- and post-morbid mechanisms. For instance, prior studies have evidenced those with clinical symptoms to perceive causal relations between these with some, e.g. PTSD symptoms perceived to cause Depressive symptoms (Frewen et al., 2012). Future investigations examining comorbid associations between C-PTSD and other psychological conditions may therefore consider application of a *Perceived Causal Relationship* approach to understanding the mechanistic relationship between disorders (Frewen et al., 2012).

Fourthly, the current study focused on diagnostic comorbidity with C-PTSD in relation to a limited number of potential comorbid conditions. For instance, the other heavily cited investigation of C-PTSD comorbidity by Karatzias et al. (2019) also found that alcohol use disorder and chronic physical health problems were over twice as likely among C-PTSD caseness compared to those without any PTSD diagnosis. Moreover, recent evidence has suggest that while PTSD symptomology is independently associated with sleep disorders and sedentary behaviours, however PTSD comorbidity with MDD and GAD symptoms is also associated with further problematic health-related behaviours and conditions such as disordered eating (Mason, LeBouthillier, & Asmundson, 2019). Together these results encourage future investigations to include a broad range of potential comorbid conditions beyond these common psychiatric diagnoses and suicidality included in the current study.

Finally, this investigation focuses on a unique sub-population in trauma-exposed military veterans living in NI, a post-conflict society. These findings may not be representative of C-PTSD psychiatric comorbidity at large. Generalisation of these results to other populations is therefore cautioned. In contrast however, these results provide a useful reference to studies focusing on similar military veterans in other contexts, such as Israel, where individuals may perform in a defence related role within their home country.

7.4.4 Conclusions

Despite the aforementioned limitations the current study offers a valuable contribution to contemporary understanding of C-PTSD and associated psychiatric comorbidity. The aim of this study was to examine the diagnostic comorbidity associated with ICD-11 C-PTSD through the investigation of two hypotheses; i) that C-PTSD would be associated with increased risk for diagnostic comorbidity, and ii) that C-PTSD would be associated with poly-morbidity across multiple disorders.

The results of this study supported both hypotheses and builds on extant evidence confirming C-PTSD to be positively associated with psychiatric comorbidity. C-PTSD was associated with elevated odds of experiencing a number of other psychological disorders and difficulties specifically; GAD, MDD, and Suicidality. Furthermore, this study contributes the first latent variable investigation of psychiatric comorbidity associated with C-PTSD. It was established that C-PTSD is associated with the aforementioned conditions both independently and concurrently through presence in two comorbid classes. The results of this study highlight the highly comorbid nature of this disorder.

Although the reclassification of PTSD and introduction of C-PTSD does not appear to have reduced estimates of psychopathological comorbidity this should not lead to criticism of the ICD-11 definition (c.f. Wisco et al., 2016). Rather the existence of comorbidity may be due to a latent interrelationship of psychopathological symptoms and constructs. Future research should seek to understand the influence and directionality of post-traumatic psychiatric symptoms and disorders associated with C-PTSD through pan diagnostic examination of symptoms.

Chapter 8.0;
General Discussion

8.1 Introduction

Traumatic stress is a salient feature in the study of health and wellbeing of military veterans. As a result of this the fields of psychotraumatology and military psychology have remained closely linked since the introduction of PTSD in the third edition of the DSM (APA, 1980). Since initial inception however researchers and practitioners have continuously revisited the definitions and criteria of the PTSD diagnosis in an attempt to better quantify the range of pathological expressions following traumatic stress resulting in numerous revisions. Notably much of the evidence driving these revisions in the past century is drawn from military veteran populations, largely from the U.S. (Andreasen, 2010; E. Jones & Wessely, 2005). Owing to growing evidence and changing perspectives on PTSD the WHO put forward the most recent development of PTSD; the codified recognition of C-PTSD in the ICD-11 manual (WHO, 2019b).

Contemporary understanding of PTSD has grown to recognise the role that different traumatic experiences beyond combat and warzone stressors may play in the development and expression of post-traumatic pathology (Andreasen, 2010). The C-PTSD concept is foundationally understood to result from prolonged and repeated trauma characteristic of circumstances including; domestic violence, childhood abuse, and captivity (J. L. Herman, 1992). A growing body of research has demonstrated that the ICD-11 C-PTSD may be present in numerous diverse trauma-exposed populations, including military veterans (Elklit et al., 2014; Palic et al., 2016). Furthermore, research indicates C-PTSD to be more prevalent than traditional PTSD in a representative population sample (Karatzias, Hyland, et al., 2019).

Given current evidence supporting the validity C-PTSD and potential relevance for both military veterans (Palic et al., 2016), and in post-conflict settings (S. Murphy et al., 2016) this construct was considered appropriate as a framework for investigating traumatic stress reactions among military veterans living in NI. While available evidence suggests the applicability of this construct to the current study population, it should be noted that the limited evidence concerning C-PTSD among military veterans have returned inconsistent results both supporting (Mordeno et al., 2019) and disparaging its application (Wolf et al., 2015).

The current investigation therefore sought to address current gaps and empirical disagreement through examination of C-PTSD in a military veteran population in NI. This thesis hence accomplished this through four primary research aims as stated in *Chapter 1*;

i. To validate the concept and measurement of C-PTSD as described by the ICD-11 within this population.
ii. To empirically examine the pathology and aetiology of C-PTSD within this population.
iii. To synthesise the findings of this investigation, and to critically evaluate how these contribute to current empirical understanding of C-PTSD.

These aims are addressed through the empirical work presented herein. The following section provides a brief summary of the relevant empirical findings of each study as they pertain to these research aims.

8.2 Summary and Implications of Research Findings

This section provides an overview of each empirical study within this thesis featuring; a statement of purpose, key findings, and relevant implications of these as they related to the aforementioned research aims.

8.2.1 Validation of the C-PTSD concept in the NI Veteran Population

The first major aim of this thesis related to the validation of the C-PTSD concept in the current study population. The purpose of this research aim was to substantiate and support the use of C-PTSD as a framework, and the ITQ as a valid measurement of this construct. This aim was addressed through the application of factor analysis (*Chapter 3*) and establishing the discriminant validity of C-PTSD criteria in relation to other PTSD diagnoses (*Chapter 4*).

The results of the CFA study presented in *Chapter 3* supported the factorial and construct validity of C-PTSD and the ITQ supporting six latent factors corresponding to symptom criteria in a two-factor higher order model, consistent with previously published factorial models (Hyland, Shevlin, Elklit, et al., 2017; Karatzias et al., 2016). This finding further supported the current definition of C-PTSD codified by ICD-11 informed by the aforementioned studies (Brewin et al., 2017; Cloitre et al., 2018). Likewise, the consistency of these findings and that of others strengthened support for the use of the ITQ and an effective measure of C-PTSD symptomology (Cloitre et al., 2018). This also lent confidence to the use of the ITQ and ICD-11 criteria for C-PTSD to be applied to additional analyses in the current investigation.

As such the following study (*Chapter 4*) applied ICD-11 criteria for C-PTSD, examining the prevalence and concordance of PTSD diagnostics in the DSM-5 and ICD-11. The results of this investigation showed over one quarter (25.3%) of participants screened positively for C-PTSD, while a smaller proportion met criteria for traditional PTSD diagnosis (7.0%) suggesting C-PTSD to be a noteworthy concern for this group. Further to this, it was found that while ICD-11 and DSM-5 PTSD displayed a ‘strong’ rate of agreement, the diagnostic criteria for C-PTSD demonstrated ‘weak’ and ‘moderate’ agreement with DSM-5 PTSD and D-PTSD respectively. These results

suggest that ICD-11 and DSM-5 screening criteria consistently identify traditional PTSD cases, however C-PTSD criteria appears to identify a distinct sub-group relative to DSM-5 diagnostic categories. This supports the use of ICD-11 criteria as PTSD criteria are reliable and consistent with the established DSM-5 manual, and that C-PTSD criteria appears to represent a novel disorder. This finding is therefore argued to support the discriminant validity of C-PTSD and highlights the need to screen specifically for this disorder, as the condition identified by clinicians and researchers largely depends on what framework and criteria are applied.

Together the results of the two aforementioned studies serve to validate the concept of C-PTSD, contributing the desired cross-cultural validation of this disorder (Cloitre et al., 2018; Karatzias, Cloitre, et al., 2017). The findings in favor of the construct validity of ICD-11 C-PTSD supports the use of the ITQ based on these criteria to accurately assess symptomology of this condition. Additionally, the effective screening and assessment of C-PTSD is called for given the prevalent nature of the disorder found in the current investigation, and the findings suggestive that the diagnostic framework or criteria applied may bias the diagnosis assigned.

8.2.2 Pathology and Aetiology of C-PTSD in the NI Veteran Population

This thesis also sought to examine the pathology and aetiology of C-PTSD. To this end three studies were conducted, two examining the pathological expression of C-PTSD through latent variable modelling of intrinsic symptoms (*Chapter 5*) and psychiatric comorbidity (*Chapter 7*), and examination of trauma predictors of C-PTSD pathology (*Chapter 6*).

Chapter 5 adopts a latent variable modeling approach (LPA) to examine patterns of symptom endorsement on the ITQ. This approach follows the methodology of Cloitre et al. (2013) to establish qualitatively different patterns of response consistent with PTSD and C-PTSD as described by the ICD-11. Differential patterns of response are replicated across samples and identify separate classes; one characterised by high endorsement of only traditional PTSD symptoms and low endorsement of DSO symptoms, and one characterised by high endorsement of PTSD and DSO symptoms

(Elklit et al., 2014; Hyland, Shevlin, et al., 2018; Karatzias, Hyland, Ben-Ezra, et al., 2018). The results of Cloitre et al. (2013) among others informed the development and adoption of C-PTSD by the ICD-11 as a distinct 'sibling diagnosis' (Brewin et al., 2017).

The results of the current investigation are at odds with the previously cited literature concerning qualitatively differed latent profiles of C-PTSD symptoms endorsement. This investigation found three distinct classes varied not by symptom quality but by symptom severity. It was however noted that this finding is consistent with a subset of studies to similarly find classes varied uniformly by symptom severity (Böttche et al., 2018; Eidhof et al., 2019; Wolf et al., 2015). The reasons for the disparity in results of this study are speculated to be owing to characteristics of the current study population. For instance, in examination of symptom endorsement prevalence it was found that all DSO symptoms were endorsed frequently in this sample (38.7% - 54.6%), potentially confounding the identification of a PTSD-only class. It is noteworthy that Wolf et al. (2015), who similarly found latent symptom profiles varied by symptom severity in a US military sample also found DSO endorsements to be high. Eidhof et al. (2019) suggests the presence of a bidirectional relationship with PTSD and DSO symptoms whereby the presence of DSO exacerbates PTSD producing a uniform pattern of response. As such it may be suggested the differential findings of C-PTSD symptom profiles in veteran populations may due to a higher prevalence of DSO symptoms confounding results.

In addition to intrinsic patterns of pathology, psychiatric comorbidity associated with C-PTSD was examined in *Chapter 7*. The purpose of this study was to further bolster the evidence gathered rating to the pathological expression of C-PTSD beyond those symptoms intrinsically recognised by ICD-11 criteria. This was accomplished through analysis of associative comorbidity with C-PTSD via regression analyses, and latent patterns of comorbidity across indicators using LCA. The rationale for this investigation led to a hypothesis that C-PTSD would be found to be highly comorbid with GAD, MDD, and Suicidality.

The results of this study supported this hypothesis demonstrating C-PTSD diagnostic caseness to be associated with elevated odds of all other psychiatric condition.

Furthermore, results supported four latent classes of comorbidity, two of which were associated with moderate and high likelihood of C-PTSD; *Depressed-Anxious*, and *High Comorbidity* respectively. This findings in summation suggested C-PTSD exists as a highly comorbid condition with other psychopathological conditions.

Primary implications of these findings pertain to the accurate assessment and treatment of C-PTSD. These results highlight the relative risk for those with C-PTSD to experience a poly-morbid pathology characterised by high likelihood of clinically relevant symptomology across numerous disorders. Recommendations for the treatment of PTSD recognise the importance of addressing psychiatric comorbidity as this serves to complicate treatment formulation and may reduce the effectiveness of intervention (Najavitis et al., 2009). A recent review and meta-analysis of treatment interventions for C-PTSD has indicated extant interventions and recommendations for traditional PTSD to be relevant for C-PTSD with moderate effectiveness (Karatzias, Murphy, et al., 2019). Karatzias, Murphy, et al. (2019) however not that DSO symptoms may contribute to treatment resistance. It is argued that specific interventions should be developed to target both PTSD and DSO symptoms for the most effective treatment (Karatzias, Murphy, et al., 2019). The results of this investigation, paired with prior evidence regarding the effects of comorbidity on treatment outcomes, further suggest that development of interventions for C-PTSD should also factor the likelihood of psychiatric comorbidity into their design.

Finally, this investigation also sought to examine the aetiology or causation of C-PTSD among the study population in *Chapter 6*. This analysis adopted Complex Trauma as a theoretical framework to understanding the origins or predictors of C-PTSD and building on those latent classes identified in *Chapter 5* examined the role of typology and cumulative nature of traumatic experiences in predicting C-PTSD class membership. The extant literature concerning Complex Trauma and ICD-11 C-PTSD suggested that traumatic exposure in childhood and events interpersonal or assaultive in nature are associated with greater likelihood of C-PTSD pathology (Courtois, 2008; Hyland, Murphy, et al., 2017; Karatzias, Hyland, et al., 2019). As such

these traumatic events were hypothesised to positively predict *High C-PTSD* class membership in this sample.

The results of these analyses partially supported the hypothesised predictors finding significant predictors in two lifetime events; *Exposure to Fire or Explosion* and *Childhood Physical Assault*. The non-significance of some expected predictors was surprising in this analysis, e.g. sexual assault as this has been robustly demonstrated as a risk factor for C-PTSD (Hyland, Murphy, et al., 2017). Subsequently, a number of childhood adversities were found to significantly predict *High C-PTSD* class membership; Sexual Abuse, Emotional Neglect, and Witnessing Maternal Victimisation. This was consistent with expectations drawn from the existing literature emphasising the salient role of childhood traumatic events in predicting greater C-PTSD symptomology (Cloitre et al., 2009; Hyland, Murphy, et al., 2017).

Together the results of this analysis support the emphasised importance of childhood traumatic experiences as a risk factor for ICD-11 C-PTSD. This is consistent with development perspectives of psychotraumatology to propose that early exposure causes developmental disturbance and thus associated with greater complexity and chronicity of outcomes (Cloitre et al., 2009; Karatzias, Hyland, et al., 2019).

In addition to examination of trauma typology, prolonged and cumulative traumatic stress is argued to define Complex Trauma (Courtois, 2008; J. L. Herman, 1992). This was likewise tested using regression models examining cumulative adulthood stressors, and cumulative childhood adversity as predictors of C-PTSD. The results of this analysis showed cumulative traumatic events and adversity in each domain to significantly predicted *Moderate Symptomatic* and *High C-PTSD* class membership. This finding is consistent with that of previous authors to show the likelihood of C-PTSD caseness to increase in a dose-response fashion in relation to trauma history (Hyland, Murphy, et al., 2017; Karatzias, Shevlin, et al., 2017). This lend additional support to contemporary understanding of traumatic risk factors for C-PTSD; that additional events increase the risk of C-PTSD pathology.

However, it should be acknowledged that other researchers have reported cumulative traumatic events in childhood to be more significantly associated with C-PTSD, relative to lifetime or adulthood cumulative trauma (Cloitre et al., 2009; Frewen et al., 2019; Karatzias, Hyland, et al., 2019). In contrast, the current investigation found effects of similar magnitude for cumulative childhood adversity and lifetime traumatic events, with total lifetime trauma associated with a slightly higher odds ratio. A possible explanation for this disparity in findings may be owing to characteristics of the sample in the current study. It is possible that due to a greater number and severity of traumatic events in adulthood the effects of childhood traumatic events are confounded in these analyses. It is likewise possible that the former occupational stressful experiences of this group as armed forces personnel contribute significantly to C-PTSD symptomology and thus produce a more substantial relationship between adulthood and lifetime stressors and C-PTSD symptom severity.

Related to this hypothesis, the role of home service in NI in predicting C-PTSD was examined testing the hypothesised relationship between this experience and increased risk of psychopathology introduced in *Chapter 1.6; The Northern Ireland Context*. The results of this analysis showed that experience of home service was a significant predictor of *High C-PTSD* class membership, and thus may be considered a risk factor for this disorder. This was coupled with the finding that Exposure to Fire or Explosion significantly predicted High C-PTSD class membership, suggesting these to likewise be risk factors for more severe symptomology. This finding suggests the importance of military experiences, i.e. characteristics of service or deployment, as a risk of more complex pathological outcomes. It is therefore recommended that comprehensive screening of C-PTSD is necessary among those with pathological distress among this group, and that consideration be given to the risk of C-PTSD in other domestic operational and post-conflict populations.

These results have further implications for the Armed Forces and clinicians that should be noted. For example, military command and support structures might consider screening for those experiences detailed as significant risk factors for higher C-PTSD symptomatology within this sample (i.e. childhood and cumulative stressors)

in recruitment and evaluation. Where individuals have a history of such experience it might be necessary to provide additional support to mitigate the risks of developing C-PTSD symptoms following further occupational/service stressors. Likewise, the finding that home service in NI was associated with greater C-PTSD symptomatology prompts consideration of how the Armed Forces might plan characteristics of service to reduce the likelihood service men and women experience potential Complex Traumas.

More broadly these results are supportive of contemporary understanding of Complex Trauma as a non-uniform risk factor for C-PTSD (Courtois, 2008). Consistent with the current recommendations of ICD-11 C-PTSD traumatic events indicative of Complex Trauma should be considered a risk factor rather than a necessary requirement for diagnosis (Cloitre et al., 2013; WHO, 2019b). It is therefore concluded the best clinical assessment of C-PTSD lies in evaluation of symptomology rather than trauma history (Bisson et al., 2019). Despite this, effective training on the role of traumatic exposure in clinical outcomes and highlighting the benefits of rigorous screening aids case formulation and treatment plans (Coyle et al., 2019). It is therefore proposed that while not necessitated by diagnostic criteria, clinicians benefit from screening for potential Complex Trauma experiences as evidenced herein.

8.3 Alternative Frameworks and Analysis

The findings and implications presented should however be acknowledged to focus on a sole theory and aspect of post-traumatic psychopathology; C-PTSD. There are alternative frameworks which may be relevant in application to the current study population. Notable examples are considered below;

The first alternative framework proposed is the use of *Continuous Traumatic Stress* (CTS). This term is used to refer to experiences of prolonged stressful exposure arising from actual or perceived ongoing threat (Eagle & Kaminer, 2013). This theoretical framework is argued to be particularly applicable in cases of political and sectarian violence (G. Stevens, Eagle, Kaminer, & Higson-Smith, 2013). Eagle and Kaminer (2013) in proposing this novel understanding of stressful experience specify four facets of CTS in the theory; Context of stressors, inability to distinguish perceived and actual threats, complex temporal characteristics of trauma, and the loss of environmental protective factors. This framework may be a suitable alternative to Complex Trauma as investigated in the current program of research as these components may be identified in the study population; e.g. perception of threat from paramilitary groups that is still reported (C. Armour, Walker, et al., 2017).

Indeed, a recent review of the evidence in favour of CTS in Israel indicated that repeated exposure to terrorism and the fear of future acts significantly contribute to post-traumatic stress, depression, and anxiety symptoms (Pat-Horenczyk & Schiff, 2019). Given the comparable nature of CTS and Complex Trauma in concept, and of these outcomes and patterns of C-PTSD comorbidity identified in the current investigation, the use of CTS is suggested as a potentially valid framework for analysis in future comparative investigations.

The second alternative framework proposed is *DESNOS*. This disorder discussed in previous chapters was historically recognised by the DSM until the most recent edition where it was removed. However the criteria PTSD have been revised to be more 'DESNOS-ish', i.e. incorporating aspects of the disorder frequently found with PTSD (Friedman, 2013). Historically C-PTSD has been considered to be highly related

to DESNOS with researchers likening C-PTSD to a development of DESNOS (Dorahy et al., 2009), and critics arguing C-PTSD/DESNOS to be ill-defined and has not justified the distinction of a new disorder (Resick et al., 2012).

Historically the DESNOS concept has been recognised as a complex adaption to traumatic stress to be associated with difficulties in regulation, self-perception, and relational difficulties, among other issues (Van Der Kolk, Roth, Pelcovitz, Sunday, & Spinazzola, 2005). Likewise, researchers have noted DESNOS to be associated with traumatic experiences in childhood and interpersonal in nature similar to those identified as risk factors for C-PTSD in the current study and by previous authors (Dorahy et al., 2009; Hyland, Shevlin, Brewin, et al., 2017). There is therefore a great deal of face validity in the comparison of these disorders given the similarity in symptoms described by both. Research among US military veterans has additionally supported the presence of DESNOS independent of PTSD (Ford, 1999). Once again, the consistency in pathology identified by the current investigation is considered supporting evidence for C-PTSD, however future research may likewise attempt to examine the discriminant validity of DESNOS and C-PTSD given their conceptual and aetiological similarity.

Finally, the concept of *Moral Injury* may be a serviceable alternative framework for understanding traumatic stress in the current population. The concept of Moral Injury describes a condition of pathological shame and guilt arising from exposure to events that violate ones deeply held moral code (Litz et al., 2009). These '*morally injurious events*' may be characterised by acts of commission, actively violating ones moral code, or omission, failing to do something upholding one's values (Litz et al., 2009). This condition is argued to be applicable to service personnel and veterans due to their operational duties placing them in situations that may lead to experience of morally injurious events (Litz & Maguen, 2012). This is particularly the case for those who served in context heavily featuring insurgent combat, as this environment may lead to callousness and distrust to be generalised to the entire population (Drescher & Foy, 2008). Furthermore, while Moral Injury is not considered a pathological condition, a recent review of Moral Injury among service personnel and veterans

indicates this condition to be a significant risk factor for PTSD, Anxiety and Depressive symptomology, and suicidality (Koenig, Youssef, & Pearce, 2019).

By way of direct application to the current investigation; the findings of the empirical work featured herein highlight that same pathologies (C-PTSD, GAD, MDD, and Suicidality) are prevalent and comorbid in the study population. This is the same pattern of psychiatric morbidity suggested to be associated with Moral Injury (Koenig et al., 2019). Further to this, the finding reported that home service is associated with C-PTSD may alternatively be understood from Moral Injury framework. The current investigation considers the experience of home service to be characteristic of Complex Trauma, however given the unique context of serving and living in one's operational theatre may represent a risk of Moral Injury and the extension of perceived potential threat to all in the population (Drescher & Foy, 2008).

The above-mentioned theoretical frameworks represent viable alternatives to understanding the results and implications discussed within this thesis, however the relative strengths and unique contributions offered by the chosen approach should also be acknowledged.

8.4 Unique Contributions of Thesis

This section provides a brief summary of some of the major strengths of the design and methodology employed through the empirical work featured in this thesis, as well as detailing more specifically some of the major contributions offered by the processes and findings thereof;

8.4.1 Value of Research Programme

Despite the potential applicability of alternative frameworks to the study of traumatic stress mentioned previously, the current investigation provided clear rationale for the relevance of C-PTSD as theoretical framework within this group. The introduction to this thesis presents a consistent theoretical framework for this approach derived from relevant evidence concerning PTSD in military veteran and post conflict settings, and how the unique features of military service in NI constitute Complex Trauma as proposed by J. L. Herman (1992). In addition to the value of the C-PTSD framework for the current population the application of C-PTSD in the current population is of great use as this emergent diagnosis is set for recognition in the ICD-11 and current evidence requires more substantiation. There remains a call for cross-cultural validation of C-PTSD (Karatzias, Cloitre, et al., 2017). As a novel population sampled; military veterans living in a post-conflict society, this investigation serves to contribute to the growing body of research related to C-PTSD from a global perspective.

Finally, the current investigation provides and end-to-end examination of C-PTSD considering the causes and predictors of the disorder, as well as a broad consideration of pathological expression. This is of great importance to understanding more general principles of C-PTSD as this area of research is in its infancy. There have been notable efforts to establish such principles of aetiology and pathology in the general population (Karatzias, Hyland, et al., 2019), while the current study examines a specific population largely excluded from C-PTSD research. The consistency in findings with regards to prevalence and pathology of C-PTSD, and associated comorbidity between this thesis and the work of Karatzias, Hyland, et al.

(2019) suggests a universal concept of C-PTSD applicable to military veterans and trauma-exposed populations more generally. This thesis thus lends greater support for this new diagnosis at large and supports specific application to understand post-traumatic stress in the NI military veteran group.

8.4.2 Contribution to Psychotraumatology and Military Psychology

As discussed, this investigation offers greater expansion to the literature concerning C-PTSD, however this may be also understood as contribution to development of the wider disciplines of Military Psychology and Psychotraumatology.

As previously stated, these fields are inextricably linked and the sequence of developments to better understanding PTSD have been drawn largely from investigation of military veterans (Andreasen, 2010). The contributions to the evidence base contained herein are in line with the discipline but address previous criticisms of US-centrism, assessment difficulties, and neglecting to examine the effects of trauma history (Andreasen, 2010). The application of C-PTSD in this respect and the empirical work of this thesis addresses these limitations; considering the effects of Complex Trauma, screening of post-traumatic diagnoses, and the application to a veteran population outside of the US. Additionally, the studies presented herein are formulated in line with the goals of ICD-11 C-PTSD implementation; cross-cultural validation, investigating accurate assessment, and replication of unique patterns of pathology (Karatzias, Cloitre, et al., 2017; Maercker, Brewin, Bryant, Cloitre, van Ommeren, et al., 2013).

The amalgamation of these investigative goals serves to address current gaps in understanding in both disciplines as these results prompt a novel understanding of traumatic stress among military veterans, and of the application of C-PTSD to a novel population. It is hoped that these results help bridge understanding between historic perspectives post-traumatic pathology and contemporary understanding developed through the novel C-PTSD concept.

8.4.3 First Investigation of C-PTSD in the NI Military Veteran Population

Furthermore, this investigation represents the first known quantitative investigation of psychological health and of C-PTSD symptomology among military veterans living in NI. To the strength of this research, this compliments the only other primary empirical sources of veteran health and well-being (C. Armour, Walker, et al., 2018, 2017; C. Armour, Waterhouse-Bradley, et al., 2018). As the only current quantitative results indicating the status of psychological health in this group, this thesis offers a preliminary evidence-based understanding of psychopathology in this group.

In addition to this, the results herein concerning C-PTSD in the NI veteran group stand in isolation as the only known empirical evidence concerning this disorder. The studies presented purposefully validate the conceptual and factorial validity of C-PTSD in this population given its novel application. As the current investigation began during the development of the ICD-11 and of C-PTSD and is completed prior to full implementation of this manual these results are at the forefront of C-PTSD criteria development and validation, contributing to wider evidence of their efficacy. Likewise, the cross-cultural validation desired for this diagnostic concept is satisfied by the current scheme of research by offering validation in an original population (Karatzias, Cloitre, et al., 2017). The results reported herein confirm that C-PTSD is a valid diagnostic concept in line with previous published structures (Hyland, Shevlin, Brewin, et al., 2017) and a relevant concern in the NI military veteran group. Moreover, key risk factors are identified including home service in NI suggesting for the first time that characteristics of service may constitute a unique risk of C-PTSD.

While these results stand in isolation concerning NI military veterans complimentary evidence is emerging to suggest police forces in the UK may similarly be at heightened risk of C-PTSD (University of Cambridge, 2019). Researchers have suggested that persistent job role traumatic exposure contributes to the risk for C-PTSD among police officers (J. K. Miller, Peart, & Soffia, 2019). It is also suggested that given this unique risk special occupational groups may benefit from skills training to cope with cumulative stressors (J. K. Miller et al., 2019). The results of this research contribute an initial foundational understanding of C-PTSD in domestic security forces population and lends support to the investigation of C-PTSD more broadly in similar

populations. Likewise, current research trends with other occupations exposed to trauma within job-role may be applicable to NI military veterans. Future research may attempt to synthesis the potential effects of occupational trauma exposure as a risk for C-PTSD.

8.4.4 First Evaluation of Discriminant Validity Between DSM-5 and ICD-11 Diagnostic Criteria

This research contributes to the construct and discriminant validity of ICD-11 criteria and measurement thereof. The difference in prevalence estimates presented by these systems highlights that the ICD-11 criteria represents a stricter definition of PTSD identifying fewer individuals than DSM-5 criteria. This answers calls from those tasked with development of ICD-11 criteria who aimed to increase the specificity of diagnosis (Maercker, Brewin, Bryant, Cloitre, van Ommeren, et al., 2013), and concurs with other researchers that ICD-11 criteria satisfies this goal (O'Donnell et al., 2014; Shevlin, Hyland, Vallières, et al., 2018; D. J. Stein et al., 2014). The replication of this finding in the current study population offers greater support for the universal application of ICD-11 PTSD criteria.

This investigation however made primary contributions in the analyses of diagnostic concordance with ICD-11 [C-]PTSD criteria and DSM-5 diagnostic categories. The strength of agreement between PTSD diagnostic criteria confirm the parity of ICD-11 and DSM-5 manuals in this regard, and replicates the results of previous research (Kuester et al., 2017; Shevlin, Hyland, Vallières, et al., 2018). The principle contribution of these findings however is in the unique examination of the concordance of C-PTSD criteria by this investigation. In this novel analysis C-PTSD was found this to display weak agreement with DSM-5 PTSD and moderate-weak agreement with D-PTSD emphasising the discriminant validity of this criteria.

This distinct approach and analysis provide a unique contribution to the establishment of C-PTSD as a discrete diagnosis. Coupled with prior factorial results supporting ICD-11 criteria represent an internally consistent and valid set of criteria, C-PTSD is also confirmed by this investigation to be distinct from other recognised

post-traumatic pathologies. Thus, the summation of these results support ICD-11 C-PTSD in its measurement and application to the NI veteran population.

8.4.5 First Latent Profile Model Using All ITQ Items

This approach differs from the vast majority of previous evidence to examine a latent variable model of C-PTSD to utilise only symptoms as indicators of latent classes, i.e. omitting indicators of functional impairment (Cloitre et al., 2013; Hyland, Murphy, et al., 2017). Given prior evidence to indicate C-PTSD to be associated with greater functional impairment relative to traditional PTSD diagnosis (Karatzias, Cloitre, et al., 2017), this was judged a worthwhile inclusion in this study. This expansion of indicators to include all items present in the validated version of the ITQ (Cloitre et al., 2018) furthers efforts to validate this measure for C-PTSD pathology. The innovation of this approach showed that across profiles there was differential endorsement of certain symptoms, e.g. NSC items, which would otherwise may not be evident from clustering of indicators.

In addition, this study contributed novel results as it was the first to examine latent profiles of C-PTSD symptoms in this population. The pattern of symptom endorsement identified was inconsistent with qualitatively different classes reported by others previously (see Cloitre et al., 2013; Elklit et al., 2014; Hyland, Murphy, et al., 2017). The *Moderate Symptomatic* class identified in this investigation did display lower endorsement of NSC items and across all domains of functional impairment, indicating classes to be differed by these indicators. The novelty of this approach and production of this finding contributes to contemporary understanding of C-PTSD, particularly among NI military veterans. A pattern of C-PTSD marked by high endorsement of all symptoms appears to exist among NI military veterans, however the lack of a 'PTSD class' suggests the potential ubiquity of DSO symptoms. As the only source of evidence on this topic however further study is required to examine the nature of latent patterns of C-PTSD symptoms in this group.

8.4.6 First Examination of Complex Trauma as a Predictor of C-PTSD Among Military Veterans

This investigation extended to work of previous authors examining the role of Complex Traumatic exposure as a precursor to C-PTSD pathology (Cloitre et al., 2009; Hyland, Murphy, et al., 2017). The current investigation built on those previous in application of a Complex Trauma theory framework examining numerous recognised stressful and traumatic events and childhood adversities. The results of these analyses were largely consistent with theory-driven expectations, and with prior empirical work implicating childhood and cumulative trauma, in childhood and adulthood, as risk factors for C-PTSD (Hyland, Murphy, et al., 2017; Karatzias, Hyland, et al., 2019).

These results however unique found that home service in NI, conceptualised as potentially qualified as Complex Trauma, was a significant risk factor for C-PTSD. The novelty in identifying this unique service characteristic to be associated with greater likelihood of C-PTSD pathology suggests the potential importance of this disorder for those with this or similar experiences. However, given the cross-sectional nature of these data such assertions are made tentatively and the need for additional prospective research with systematic evaluation of military service characteristics and experience is acknowledged.

8.4.7 First Investigation of Latent Patterns of Comorbidity with C-PTSD

Finally, this investigation presents the first known examination of psychiatric comorbidity with C-PTSD using latent variable modelling techniques. Previous research has indicated C-PTSD with be highly and positively associated with psychiatric conditions (Karatzias, Hyland, et al., 2019). These studies may however be considered to be limited by use of regression exclusively, showing relationships between C-PTSD and another diagnosis in isolation. This investigation therefore applied used and LCA approach to investigate a more elaborate relationship between diagnoses, showing probable associations between multiple indicators (Cai, 2012). The results of this approach confirmed hypotheses that C-PTSD would be associated

with multiple co-morbidities concurrently, highlighting the potential for severe poly-morbid distress associated with this disorder.

The value of this contribution lies in the extension of current knowledge of how C-PTSD is related to other psychological conditions. This finding is considered to have implications for both basic and applied research as C-PTSD is better understood within the broader scope of psychopathological distress, and the likelihood of highly co-morbid presentations in clinical cases of C-PTSD is suggested.

8.5 Summary of Major Study Limitations

While relevant strengths and limitations are discussed within their respective empirical chapters previously there exist some global limitations of design and methodology of the current investigation that should be considered.

Firstly, in the design of the current investigation the primary focus and rationale for study centres on C-PTSD as defined by the ICD-11. This is necessarily limited in scope as all potential factors cannot be understood from a single framework. A review of establishing literature prompting the choice of this framework for this current study supported its application throughout this thesis, however as discussed within this chapter (see *Chapter 8.3; Alternative Frameworks and Analyses*) there are potential viable alternative approaches that may explain the patterns of traumatic stress in this population. The value of examining C-PTSD and the conclusions produced as a result has however been established in summary of the unique contributions of this thesis.

Moreover, this investigation adopted a wholly quantitative and cross-sectional design limiting implications of causation. Clear rationale is provided from the proposed directionality and of effects within these analyses however, it should be acknowledged that these effects cannot be considered causative as not all extraneous variables may be factored. For instance, the observed predictive ability of home service in NI on C-PTSD may be confounded by the presence of childhood and exposure to conflict in NI not related to military service. Future studies investigating traumatic stress amongst this population should therefor seek to establish temporal and perceived causative roles of traumatic events on psychopathology.

Secondly, while this investigation endeavoured to adopt a holistic understanding of C-PTSD there are notable limitations in measurement of traumatic experiences. While this investigation attempted fairly comprehensive measurement of traumatic experiences and adversities through established psychometric instruments, these are acknowledged to only represent screening measurement of traumatic experiences. Previous studies have indicated that the timing and interaction of childhood vs. adulthood traumatic experiences may significantly influence C-PTSD development (Cloitre et al., 2009). The conclusions of this investigation regarding the predictive

effects of cumulative trauma are caveated as systematic and interactive effects are not known in these data. The results presented are rather indicative of the general relationship between Complex or cumulative Trauma and C-PTSD more generally.

Thirdly, the representativeness of these data and introduction of potential biases should be acknowledged. It is difficult to confidently comment on the representativeness of the sample relative to the NI veteran population as there is no authority on its characteristics due to the hidden and hard-to-reach nature of the group. As such the major limitation should be noted that it cannot be known how well these data represent the NI veteran group at large and reduces the ability to formally evaluate potential bias.

In the absence of direct comparators, the characteristics of this sample are contrasted with data from the wider UK armed forces/veteran population. Comparing to data from the King's Military Cohort study the current sample had many similar demographic characteristics (e.g. predominately male, served in the Army, in a relationship or married). However, the sample in the current investigation differed somewhat in demographic variables relative to those found by Stevelink et al. (2018), chiefly; being older in mean age by approximately 14 years across samples, and having markedly fewer individuals still in service (e.g. as a reserve). This may be in part due to differences in the veteran population in NI relative to those in British veterans of the Iraq and Afghan conflicts studied by Stevelink et al. (2018). It should however be noted the 2017 MOD Annual Population Survey reported the wider veteran population to be typically older, comprised of two thirds over the age of 65 (MOD, 2017). However, as this survey excluded NI conclusions about the demographic representativeness of these data is heavily cautioned.

It should also be noted those in this sample reported a greater burden of mental health difficulties relative to those in the King's Military Cohort (Stevelink et al., 2018). This once again might be attributed to self-section bias as those with psychopathological symptoms may be inclined to participate in this openly disclosed 'psychological health survey' (Khazaal et al., 2014). Alternatively, this elevated mental health burden might be attributable to a greater incidence of trauma and mental ill-health in NI (Bunting et al., 2013; Karem et al., 2014). Once again as evidence is

currently sparse regarding the (psychological) health status of military veterans in NI these unique characteristics are acknowledged as potential limitations of these data. Representative population research is called for to assess the true burden of psychological ill-health in this population and the representativeness of these data.

Fourthly, the analyses and results presented as part of this investigation largely concern the collation and categorisation of data. For instance latent variable modelling is a robust approach to investigating trends and patterns within data, however such an approach may be considered viable-centred and represents a heuristic relationship between variables that may not be wholly representative of actual cases (Lanza & Rhoades, 2013). Further to this, the potential for research introduced bias in the interpretation of latent variable and SEM results should be acknowledged. These techniques are argued to provide robust and powerful methods to understand complex phenomena and reduce these to comprehensible models (Jeon, 2015). However, this reduction in complexity may introduce bias through incorrect or reductive interpretation of model findings (Jeon, 2015). This investigation was informed by a wealth of previous theoretical and empirical work to ensure accurate interpretation and attribution of latent variables however the possibility for error and alternate interpretations should be acknowledged.

Finally, the effects of missing data and its estimation are considered as a potential limitation in this study. While the estimation of missing data in is commonplace in psychology and social science disciplines the effects and most effective approaches remain contested (Graham, 2009). Critiques argue that the estimation of missing data may produce non-representative results as this may produce bias imputed values (Bolland, Tomek, & Bolland, 2017). Horton and Kleinman (2007) however argue in the title of their paper, such concerns are “Much Ado About Nothing”. Contemporary methods of missing data estimation are adequately sophisticated that while some bias is introduced by estimation of imputation of missing values this is negligible (Horton & Kleinman, 2007). Across empirical studies contained in this investigation best practices were followed; patterns of missingness in data were examined and appropriate methods applied to estimation (Graham, 2009; Little, 1988). Despite this, the potential introduction of bias and need for replication of findings is recognised.

8.6 Suggested Future Directions for Research

The strengths and contributions of this investigation as a whole address a number of empirical gaps and contemporary issues in the understanding of C-PTSD, however the experience and findings arising from this investigation prompt consideration for lines of future enquiry. While relevant and specific direction for future research are discussed within empirical chapters, more general suggestions are presented below;

Firstly, this thesis presents the only currently known investigation of C-PTSD among NI military veterans. Studies have examined this condition among US (Wolf et al., 2015), Filipino (Mordeno et al., 2019) and Israeli (Palic et al., 2016; Zerach et al., 2019) veterans. Across these studies C-PTSD has been found to be a present and relevant concern in veteran populations, however these studies represent the general summation of evidence. It is therefore imperative that additional research be conducted to strengthen the conclusion presented herein, and to extend understanding of C-PTSD among military veterans. It may likewise be prudent to examine the competing theoretical frameworks discussed (e.g. Moral Injury, D-PTSD, CTS) in tandem with future investigations of C-PTSD in the NI veteran population to delineate the potential explanatory effects of these.

Secondly, further complimentary analyses toward the validation and substantiation of C-PTSD in this population is suggested. As previously discussed, the application of network analysis appears to be a valid and compatible extension. Recent publication have found network structures of ICD-11 C-PTSD to be consistent and replicated across populations in Austria, the UK, and Lithuania with feelings of worthlessness being the most central symptom (Knefel, Lueger-Schuster, Bisson, et al., 2019). Given the potential for NSC items to differentiate symptom classes in the current investigation it is suggested that further exploration using Network Analysis as an alternative analytic method would allow for stronger conclusions to be drawn about the latent structure of C-PTSD in this population specifically.

Thirdly, this investigation provides indicative evidence in support of contemporary Complex Trauma theory. Limitations in measurement of trauma and adversities are

however acknowledged in the application of screening measures. It is therefore proposed that future studies attempting to investigate the role of trauma quality and chronicity employ more systematic assessment of trauma history. This may perhaps be best suited to clinician assessment of trauma history to document the extent and interactive effects of multiple stressful events and resulting distress.

Fourthly, the results of the LPA of C-PTSD symptoms were inconsistent with the majority of the wider literature. Among those results in agreement with those reported herein is that of Wolf et al. (2015). These studies similarly investigated the concept of C-PTSD in military veteran samples and report similar latent patterns of endorsement varied by severity. The shared finding of patterns by these studies to be divergent relative to the literature at large perhaps suggest some aspect of military experience is more associated with C-PTSD than traditional PTSD diagnosis. There is however a lack of empirical evidence to draw such conclusions confidently. It is therefore suggested that additional research be conducted to examine the profiles of response associated with C-PTSD in military veteran populations.

Fifthly, C-PTSD was evidenced to be highly poly-morbid in the current investigation; associated concurrent GAD, MDD, and Suicidality. The mechanisms and directionality underlying this relationship however remain unclear and necessitate further inquiry. This may be accomplished through longitudinal and prospective research of the development of post-traumatic pathology, and investigation of potential extraneous variables driving the association between these conditions. Future research may adopt a more granular approach to analysis such as Network Analysis to compliment the findings of this investigation and test hypothesised ‘bridge symptoms’ (see Cramer et al., 2010) between C-PTSD and these other conditions.

Finally, along the lines of the previous recommendation and among the most salient directions for future research is the identification of effective treatment plans for those with C-PTSD. Current evidence suggests that those with C-PTSD are somewhat responsive to traditional treatments, but these individuals may experience a myriad of difficulties complicating treatment (Brewin, 2019). The results of this investigation, in conjunction with other contemporary sources (see Karatzias, Hyland, et al., 2019), highlight the issue of psychopathological comorbidity with C-PTSD in particular.

Future studies should seek to disentangle the relationship between C-PTSD and other psychiatric conditions, potentially identifying effective targets for intervention reducing pathology across the domain commonly expressed. The identification of therapeutic targets and techniques specific to C-PTSD is likewise of great importance (Karatzias, Hyland, Bradley, et al., 2018; Karatzias, Murphy, et al., 2019). However, this domain of C-PTSD research is in its infancy and effective treatments remain under explored in veteran samples with much literature applying lessons learned from studies of other populations, and DESNOS among veterans (Courtois & Ford, 2019). As such specific examinations of treatment strategies for reducing ICD-11 C-PTSD pathology in the military veteran group are called for.

8.7 Concluding Remarks

The primary aim of the current programme of research was to investigate the potential utility, relevance, and expression of the nascent C-PTSD diagnostic construct in a sample of military veterans living in NI. The empirical studies presented herein address this overarching aim; confirming the validity of C-PTSD in the study population, finding C-PTSD to be a distinct and prevalent condition, highlighting relevant traumatic risk factors for C-PTSD pathology, and demonstrating this disorder to be highly comorbid with other psychiatric conditions. These findings confirm C-PTSD to be a relevant concern in the NI military veteran population and emphasise the importance of expanding this understanding of post-traumatic stress and Complex Trauma to this group.

The results presented contribute to contemporary understanding regarding the pathology and aetiology of C-PTSD, confirming principles of this disorder and highlighting the need for further investigation of symptomology and associated traumatic experiences in the veteran population. The current investigation is exploratory in nature and suggests the relevance of C-PTSD for the study population, and therefore the need for further research is paramount. It is hoped the evidence presented herein stimulates such work and contributes to the wider effort to ensure cross-cultural validation of C-PTSD and the ITQ.

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Appendices

Appendix 1.0; Ethical Approval from Ulster University

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Our Ref: NC:GOV

Dr C Armour
Psychology Research Institute
Ulster University
Coleraine Campus

06 July 2017

Dear Dr C Armour

Research Ethics Committee Application Number: REC/17/0031

Study Title: The Health and Well-Being of Military Veterans Living in Northern Ireland

Thank you for your recent response to matters raised by the committee. This has been considered and the decision of the committee is that the research should proceed.

Please also note the additional documentation relating to research governance and indemnity matters, including the requirements placed upon you as Chief Investigator.

The committee's decision is valid for a period of three years from today's date (this means that the study should be completed by that date). If you require this period to be extended, please contact the Research Governance section.

1. **Please complete and return the Chief Investigator Statement of Compliance prior to commencing the study and keep a copy for your file.**

2. **Please retain all other documents.**

Further details of the University's policy along with guidance notes, procedures, terms of reference and forms are available on the Ulster University Portal.

If you need any further information or clarification of any points, please do not hesitate to contact me.

Yours sincerely

Nick Curry
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ULSTER UNIVERSITY

RESEARCH GOVERNANCE

Project Reference Number: REC/17/0031

Project Title: The Health and Well-Being of Military Veterans Living in Northern Ireland

Statement on indemnity for staff and students conducting research on human participants

The University is indemnified, through its insurance policies (and subject to the terms and conditions of these policies), for its staff and students engaged in the pursuit of research involving human participants where the research is being conducted for and on behalf, and with the prior knowledge and consent of, the University.

However, the University is not indemnified through its insurance for non-negligent harm. Legal liability does not arise where a person suffers harm but no-one has acted negligently. The University cannot offer advance indemnities or, generally, insure against non-negligent harm, although such indemnity can be applied for in specific cases and where it is considered to be an essential element of the study.

Participants in research studies (research subjects) should be made aware in the information provided to them of the University's position.

This statement is only valid if it is on headed paper, is signed and bears the Research Governance stamp.

Nick Curry
Head of Research Governance

DATE: 06 July 2017

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ULSTER UNIVERSITY **RESEARCH GOVERNANCE**

Chief Investigator Statement of Compliance

To be returned following receipt of a favourable ethical opinion and/or HSC Trust permission and prior to commencement of the study

Name of CI: Dr C Armour
Ulster Research Governance Study Ref: REC/17/0031
ORECNI Study Ref: N/A
Study title: The Health and Well-Being of Military Veterans Living in Northern Ireland

Collaborating HSC/NHS organization: N/A

I understand that Ulster University has agreed to act as sponsor/co-sponsor or equivalent for the above study and that this places certain obligations upon me as Chief Investigator.

These are:

- to adhere to the research ethics, governance and other appropriate policies of the University and any HSC/NHS organisation involved in the study
- to conduct the study in full compliance with the approved protocol
- to report any adverse events as required by the University and HSC/NHS procedures
- to provide interim and final reports on the progress and outcomes of the study
- to seek advance permission for any amendments or extensions to the study
- where appropriate to register the study on a publicly accessible database

I agree to the above and confirm that:

- the host HSC/NHS organisation (where applicable) is aware of and supports this study
- a favourable ethical opinion has been obtained (where applicable) and the study will commence on

  date: 07/07/17

  and end on

  date: 31/12/17

Signed: ..... Date: 06/07/17
(Chief Investigator)

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ULSTER UNIVERSITY **RESEARCH GOVERNANCE**

Research on human participants being conducted by staff and/or students of the University

Please find attached a letter from the University Research Ethics Committee confirming that it has considered and approved your application to undertake research involving human participants.

The University's policy requires the Research Governance section to:

- Seek confirmation that arrangements are in place for the research to begin, including arrangements to manage the study
- Ensure that the research protocol, the investigators and the environment are appropriate
- Confirm that ethical approval has been obtained before a study begins
- Ensure that good practice arrangements are maintained for the duration of the study in relation to the conduct of the study, monitoring and reporting (including the immediate reporting of adverse events)

The requirements upon the investigators are to:

- conduct the study in line with the approved protocol
- retain and maintain records, including hard copies of signed consent forms, appropriately
- provide reports as required during and at the end of the study
- report any adverse events
- seek prior approval for amendments to the protocol

In addition to complying with the University's requirements, you must also familiarise yourself with the requirements of any other organisations involved in the research as collaborators, hosts or funders.

Please do not hesitate to contact Research Governance should you require any further information.

C Bell

Nick Curry
Head of Research Governance
028 9036 6629
n.curry@ulster.ac.uk

Research & Innovation

ULSTER UNIVERSITY **RESEARCH ETHICS COMMITTEE**

Guidance

I have received ethical approval from the University Research Ethics Committee (UREC). What should I do now?

You can commence the research once you have completed and returned the Chief Investigator Statement of Compliance and have all other necessary permissions and approvals in place.

What should I do if...

the commencement of the research is delayed?

Contact the Research Governance office. They will confirm when the ethical approval expires and advise you whether or not there is anything you need to do.

the research takes longer than originally indicated?

The Research Governance office will advise whether or not the period of ethical approval will expire prior to the completion of the project. You might have to apply for an extension of the period of ethical approval. If this is the case, you should do so before the current approval period expires (see the next question).

there is an amendment to my project?

It is likely that any amendment will result in changes to the research team, the protocol, participant information sheets or will have implications for recruitment or the scientific quality of the research. Any such amendments (except for urgent safety measures) will require approval from the UREC. You should complete form RG6 available on the Ulster University Portal.

I am asked to complete a progress report?

For projects lasting longer than 12 months, progress reports are requested on behalf of the UREC by the Research Governance Office. You should complete a short progress report indicating the date of commencement and details of progress to date. Ethical approval is kept under review by the UREC.

I am asked to complete a final report?

As Chief Investigator, you have signed a Statement of Compliance requiring you to provide a final report on the outcomes of the project. This report should detail any difficulties or adverse events, outcomes, publications/other output and further research that is likely to take place as a result of your project.

An adverse event occurs?

Urgent safety measures undertaken to protect participants or researchers should be notified at the earliest opportunity. The procedures for reporting such occurrences are available on the Ulster University Portal.
For projects involving the use of relevant material under the Human Tissue Act, see also SOP 9, available on the Ulster University Portal.

Appendix 1.1; Ethical Affirmation from Queen's University, Belfast

QUEEN'S UNIVERSITY BELFAST

Date:	12 June 2019
To:	Professor Cherie Armour
Faculty REC Reference Number:	EPS 19_156
Full Title:	The health and wellbeing of military veterans living in Northern Ireland

Thank you for your application for Affirmation of an Existing Ethical Approval, which was received on 07 June 2019. The application and supporting documents were originally approved by Ulster University Research Ethics Committee (REC Reference: REC 17/0031).

I can confirm that the ethical approval from Ulster University Research Ethics Committee has been **affirmed** by the Faculty of Engineering and Physical Sciences Research Ethics Committee (EPS Faculty REC).

Conditions of the Affirmation

The Faculty REC affirmation of the existing ethical approval is subject to the following conditions:

(i) The study must be conducted in accordance with all relevant legislation. All relevant management approvals from organisations involved in the research must be obtained.
(ii) When the research involves human volunteers the study must be entered on the University's Insurance Database.
(iii) Monitoring and auditing process must be complied with including submission of annual progress reports to the Faculty REC.

It is the Chief Investigator's responsibility to ensure the study is conducted in accordance with the conditions stipulated.

Any future changes to any part of the submitted application, protocol or supporting documentation must be notified to the Committee prior to these changes taking place.

Submitted Documents

The documents submitted are listed in the table below.

Documentation Received	Version	Date
Confirmation of Existing Approval Application Form		07 June 2019
Ethical Approval from Ulster University Research Ethics Committee		06 July 2017
Application Form submitted to Ulster University Research Ethics Committee, including all study-specific documentation, subsequent amendments and associated approvals		Received 07 June 2019

If you would like to discuss this further please contact the Research Ethics Officer, Miss Kathryn Taylor, at facultyreceps@qub.ac.uk or by telephone on 028 90972529.

Yours sincerely

Kathryn Taylor

pp Professor Brendan Murtagh
Chair, EPS Faculty REC

Appendix 2.0; Survey Participant Information Sheet and Consent Form

Participant Information Sheet

The Health and Well-being of Military Veterans Living in Northern Ireland

You are being invited to take part in a research study, which is part of a wider Northern Ireland Veterans' Health and Well-being Project. The research is being undertaken by Ulster University and Prof. Cherie Armour is the Principal Investigator. Ethical approval for the study has been granted by the Ulster University Research Ethics Committee. Please read the following information and make sure that you are happy before you decide whether to participate. Thank you for taking the time to consider this invitation.

What is the purpose of the study?
This survey aims to examine the health and wellbeing of British Armed Forces veterans who are currently living in Northern Ireland. The results of the study will be used to further our understanding of the experiences and issues faced by the Northern Ireland veteran community; and to inform service provision within Northern Ireland.

Who is organising the funding for the study?
The study is funded by the Forces in Mind Trust (FiMT) and the Big Lottery Fund.

Who is a veteran?
You are a veteran if:

- You served at least one day in any branch of the Regular British Armed Forces, but no longer serve (you may still be serving with the Reserves)
- You served with the Reserves only (and no longer serve)

You can complete this survey if you answered 'yes' to one of the points above, AND you are over 18yrs old and currently live in Northern Ireland.

Do I have to take part?
Your participation is entirely voluntary. However, we would like to encourage all veterans to contribute to the research by completing the survey.

What will participation involve?
Participation requires the completion of a questionnaire, which takes approximately 90 minutes to complete.

We will be asking about your personal health and well-being and potential welfare issues. Topics covered in the questionnaire include (but are not limited to) subjective well-being,

social support, financial problems, alcohol consumption, mental health issues, but also topics such as exposure to traumatic events, violence from and against your partner and thoughts about suicide. It is important for you to know that your responses to the questions CANNOT be used to diagnose a mental illness as this can only be done by a qualified mental health professional.

Some of the areas covered in the survey are sensitive in nature. Your responses will be confidential and anonymous as there will be no way to link them to you personally. We hope that participation will not cause you any concern and you should know that you are free to withdraw from the study at any point without giving a reason. However, due to the anonymous nature of the survey, once you have withdrawn from the study or completed it, it will not be possible to withdraw your responses. You are under no obligation to answer any or all of the questions, but we would appreciate if you could answer as many as you can.

If you are filling out the online questionnaire, you can complete it in more than one session by simply closing the window and coming back to the questionnaire at any time within the next 7 days (Please use the original web-link AND the same device).

Will my participation in this study be kept confidential?
Under the terms of the Data Protection Act (1998), your involvement will remain confidential and your responses to the survey will be anonymous.

Are there any possible benefits in taking part?
It is hoped that the information collected in this study will inform relevant service providers of the potential needs of the veteran community and also help to shape future service provision available to veterans in Northern Ireland.
Additionally, upon completion of the survey, you will have a chance to be entered into a prize draw, where you will have the opportunity to win a voucher (valued at £150) as a token of our appreciation for your participation. We will hold a prize draw once a month for the duration of the study.

How can you make a complaint?
Complaints can be discussed in the first instance with the Principal Investigator Prof. Cherie Armour (contact information below) who will try to resolve your complaint to your satisfaction. If this fails to resolve your concern or complaint, you can direct your complaint to Ulster University. Your complaint will be addressed in accordance with the University's Complaint Process.

Indemnity for this study has been secured through the Ulster University's Research Governance processes. A copy of the letter confirming indemnity is available from us on request.

What should you do now?
If you are willing to participate, please complete the Informed Consent document and proceed to complete the survey.

Thank you for reading this information sheet and considering participating in this study. Please contact us on the details below should you have any queries.

Yours sincerely

Prof. Cherie Armour
Northern Ireland Veterans' Health and Wellbeing Study

Contact Information:
If you have any further queries which have not been addressed in the current document, please feel free to contact a member of the research team at:

Address: NI Veteran Study
Room H263
Faculty of Life and Health Sciences
Ulster University
Cromore Road
Coleraine, BT52 1SA
Email: NIVeteranStudy@gmail.com
Tel: 028 7012 3915

Contact details for the Principal Investigator:

Email: c.armour1@ulster.ac.uk
Tel: 028 7012 3374

Informed Consent Document

The Health and Well-being of Military Veterans Living in Northern Ireland

If you wish to participate in the above study, please read and initial the following to express consent:

	Initial here
I confirm that I have read and understood the participant information sheet for this study and have had the opportunity to ask questions which have been answered satisfactorily.	[ ]
I understand that I will be asked sensitive questions about my mental health and questions about perpetration of violence.	[ ]
I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason, and without my rights being affected in any way.	[ ]
I understand that the information I provide in this questionnaire will be used for research purposes and not in a manner which would allow identification of individual responses.	[ ]
I confirm that I am a military veteran living in Northern Ireland.	[ ]
I agree to take part in this research study.	[ ]

Please note that this page will be kept separate from your answers at all times.

Appendix 2.1; Survey Excerpt – International Classification of Diseases Trauma Questionnaire

Below is a list of problems and complaints that people sometimes have in response to traumatic or stressful life experiences. Please answer these questions with regard to your WORST EVENT which you identified earlier in the survey. We understand that some of these items may repeat what we have asked before, but it is important that you answer the questions again. Please select the option which indicates how much you have been bothered by each problem IN THE PAST MONTH.

		Not at all	A little bit	Moderately	Quite a bit	Extremely
10.1	Having upsetting dreams that replay part of the experience or are clearly related to the experience?	☐	☐	☐	☐	☐
10.2	Having powerful images or memories that sometimes come into your mind in which you feel the experience is happening again in the here and now?	☐	☐	☐	☐	☐
10.3	Being reminded of the experience and then spacing out for a while.	☐	☐	☐	☐	☐
10.4	Having moments when you lost control and acted like you were back in the experience?	☐	☐	☐	☐	☐
10.5	Having a memory of the experience come back to you that was so strong that you lost track of what was going on around you?	☐	☐	☐	☐	☐
10.6	Reacting to people or situations as if you were back in the past experience?	☐	☐	☐	☐	☐
10.7	Feeling very upset when something reminded you of the experience?	☐	☐	☐	☐	☐
10.8	Avoiding internal reminders of the experience (for example, thoughts, feelings, or physical sensations)?	☐	☐	☐	☐	☐
10.9	Avoiding external reminders of the experience (for example, people, places, conversations, objects, activities, or situations)?	☐	☐	☐	☐	☐
10.10	Being "super-alert", watchful, or on guard?	☐	☐	☐	☐	☐
10.11	Feeling jumpy or easily startled?	☐	☐	☐	☐	☐
10.12	Having powerful images or memories that sometimes come into your mind in which you feel the experience is happening again in the here and now, even if only for a moment?	☐	☐	☐	☐	☐

In the past month have the above problems described in questions 10.1 – 10.12:

		Not at all	A little bit	Moderately	Quite a bit	Extremely
10.13	Affected your relationships or social life?	☐	☐	☐	☐	☐
10.14	Affected your work or ability to work?	☐	☐	☐	☐	☐
10.15	Affected any other important part of your life such as parenting, or school or college work, or other important activities?	☐	☐	☐	☐	☐

Below are problems or symptoms that people who have had stressful or traumatic events sometimes experience. The questions refer to ways you typically feel, ways you typically think about yourself and ways you typically relate to others. Answer the following thinking about how true each statement is of you:

		Not at all	A little bit	Moderately	Quite a bit	Extremely
10.16	I react intensely to things that don't seem to affect other people so much.	☐	☐	☐	☐	☐
10.17	When I am upset, it takes me a long time to calm down.	☐	☐	☐	☐	☐
10.18	My feelings tend to be easily hurt.	☐	☐	☐	☐	☐
10.19	I experience episodes of uncontrollable anger.	☐	☐	☐	☐	☐
10.20	I do things that people have told me are dangerous or reckless (for example, driving very fast).	☐	☐	☐	☐	☐
10.21	I feel numb or emotionally shut down.	☐	☐	☐	☐	☐
10.22	I am the kind of person who has difficulty experiencing feelings of pleasure or joy.	☐	☐	☐	☐	☐
10.23	When I am under stress or confronted with reminders of my trauma, I often feel that the world is distant or that the world seems different (for example, time slows down, things look different).	☐	☐	☐	☐	☐
10.24	When I am under stress or confronted with reminders of my trauma, I often feel outside of my body or feel that there is something strange about my body.	☐	☐	☐	☐	☐
10.25	I have difficulty knowing what I feel and describing my feelings.	☐	☐	☐	☐	☐

		Not at all	A little bit	Moderately	Quite a bit	Extremely
10.26	I feel like a failure.	☐	☐	☐	☐	☐
10.27	I feel worthless.	☐	☐	☐	☐	☐
10.28	I often feel ashamed of myself whether it makes sense or not.	☐	☐	☐	☐	☐
10.29	I feel guilty about things I have done or failed to do.	☐	☐	☐	☐	☐
10.30	I feel distant or cut off from people.	☐	☐	☐	☐	☐
10.31	I find it hard to stay emotionally close to people.	☐	☐	☐	☐	☐
10.32	I avoid relationships because they end up being too difficult or painful.	☐	☐	☐	☐	☐

In the past month, have the above problems described in questions 10.16 – 10.32:

		Not at all	A little bit	Moderately	Quite a bit	Extremely
10.33	Created concern or distress about your relationships or social life?	☐	☐	☐	☐	☐
10.34	Affected your work or ability to work?	☐	☐	☐	☐	☐
10.35	Affected any other important part of your life such as parenting, or school or college work, or other important activities?	☐	☐	☐	☐	☐

Validated International Trauma Questionnaire Items;

Survey Item Number	*Symptom Reference*	*Item Text*
10.1	Re1	Having upsetting dreams that replay part of the experience or are clearly related to the experience?
10.2	Re2	Having powerful images or memories that sometimes come into your mind in which you feel the experience is happening again in the here and now?
10.8	Av1	Avoiding internal reminders of the experience (for example, thoughts, feelings, or physical sensations)?
10.9	Av2	Avoiding external reminders of the experience (for example, people, places, conversations, objects, activities, or situations)?
10.10	Th1	Being “super-alert”, watchful, or on guard?
10.11	Th2	Feeling jumpy or easily startled?
10.13	PTSDFI1	Affected your relationships or social life?
10.14	PTSDFI2	Affected your work or ability to work?
10.15	PTSDFI3	Affected any other important part of your life such as parenting, or school or college work, or other important activities?
10.17	AD1	When I am upset, it takes me a long time to calm down.
10.21	AAD2	I feel numb or emotionally shut down.
10.26	NSC1	I feel like a failure.
10.27	NSC2	I feel worthless.
10.30	DR1	I feel distant or cut off from people.
10.31	DR2	I find it hard to stay emotionally close to people.
10.33	DSOFI1	Created concern or distress about your relationships or social life?
10.34	DSOFI2	Affected your work or ability to work?
10.35	DSOFI3	Affected any other important parts of your life such as parenting, or school or college work, or other important activities?

Re = Re-Experiencing, Av= Avoidance, Th = Sense of Threat, PTSDFI = Post-Traumatic Stress Disorder Functional Impairment

AD = Affect Dysregulation, NSC= Negative Self-Concept, DR= Disturbed Relationships, DSOFI = Disturbance in Self Organisation Functional Impairment.

(Cloitre et al., 2015, 2018)

Appendix 2.2; Survey Excerpt – PTSD Checklist 5

Below is a list of problems that people sometimes have in response to a very stressful experience. Keeping your WORST EVENT in mind, please read each problem carefully and indicate how much you have been bothered by that problem <u>IN THE PAST MONTH.</u>

In the past month how much were you bothered by:

		Not at all	A little bit	Moderately	Quite a bit	Extremely
8.1	Repeated, disturbing, and unwanted memories of the stressful experience?	☐	☐	☐	☐	☐
8.2	Repeated, disturbing, dreams of the stressful experience?	☐	☐	☐	☐	☐
8.3	Suddenly feeling or acting as if the stressful experience were actually happening again (as if you were back there reliving it)?	☐	☐	☐	☐	☐
8.4	Feeling very upset when something reminded you of the stressful experience?	☐	☐	☐	☐	☐
8.5	Having strong physical reactions when something reminded you of the stressful experience (for example heart pounding, trouble breathing, sweating)?	☐	☐	☐	☐	☐
8.6	Avoiding memories, thoughts, or feelings related to the stressful experience?	☐	☐	☐	☐	☐
8.7	Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)?	☐	☐	☐	☐	☐
8.8	Trouble remembering important parts of the stressful experience?	☐	☐	☐	☐	☐
8.9	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)?	☐	☐	☐	☐	☐
8.10	Blaming yourself or someone else for the stressful experience or what happened after it?	☐	☐	☐	☐	☐
8.11	Having strong negative feelings such as fear, horror, anger, guilt, or shame?	☐	☐	☐	☐	☐
8.12	Loss of interest in activities that you used to enjoy?	☐	☐	☐	☐	☐
8.13	Feeling distant or cut off from other people?	☐	☐	☐	☐	☐

		Not at all	A little bit	Moderately	Quite a bit	Extremely
8.14	Trouble experiencing positive feelings (for example, being unable to feel happiness or have loving feelings for people close to you)?	☐	☐	☐	☐	☐
8.15	Irritable behaviour, angry outbursts, or acting aggressively?	☐	☐	☐	☐	☐
8.16	Taking too many risks or doing things that could cause you harm?	☐	☐	☐	☐	☐
8.17	Being "super-alert" or watchful or on guard?	☐	☐	☐	☐	☐
8.18	Feeling jumpy or easily startled?	☐	☐	☐	☐	☐
8.19	Having difficulty concentrating?	☐	☐	☐	☐	☐
8.20	Trouble falling or staying asleep?	☐	☐	☐	☐	☐
8.21	Feeling as if you were separated from yourself, like you were watching yourself from the outside or observing your thoughts and feelings as if you were another person. Or feeling as if you were in a dream, even though you were awake, or feeling as if something about you wasn't real, or feeling as if time was moving more slowly. *(Please do NOT include states of alcohol or drug intoxication.)*	☐	☐	☐	☐	☐
8.22	Feeling that things going on around you seemed unreal or very strange and unfamiliar. Or feeling that things seemed like a dream or like a scene from a movie, or feeling that things seemed distant or distorted. *(Please do NOT include states of alcohol or drug intoxication.)*	☐	☐	☐	☐	☐

*** *Please continue on the next page* ***

(Weathers et al., 2013)

Appendix 2.3; Survey Excerpt – Stressful Life Events Screening Questionnaire

The following questions ask about many different types of stressful life events. These kinds of events can be frightening or distressing to almost everyone. If you answer "Yes" to any of these questions, please indicate how many times you experienced the event.

During your life (both in Service and as a civilian), have any of the following events ever happened to you…

7.1 Have you ever had a life-threatening illness?

☐ … Yes ⟶ How many times? _____

☐ … No

7.2 Were you ever in a life-threatening accident?

☐ … Yes ⟶ How many times? _____

☐ … No

7.3 Have you ever experienced a natural disaster (e.g. flood, hurricane, tornado, earthquake)?

☐ … Yes ⟶ How many times? _____

☐ … No

7.4 Have you ever experienced a fire or explosion?

☐ … Yes ⟶ How many times? _____

☐ … No

7.5 Have you ever been exposed to a toxic substance (e.g. dangerous chemicals, radiation)?

☐ … Yes ⟶ How many times? _____

☐ … No

18

7.6 **Was physical force or a weapon ever used against you in a robbery or mugging?**

☐ ... Yes ⟶ How many times? _____

☐ ... No

7.7 **Has an immediate family member, romantic partner, or VERY CLOSE friend died as a result of accident, homicide or suicide?**

☐ ... Yes ⟶ How many times? _____

☐ ... No

7.8 **When you were a child or more recently, did anyone (parent, other family member, romantic partner, stranger or someone else) ever succeed in PHYSICALLY FORCING you to have intercourse, or oral or anal sex against your wishes OR when you were in some way helpless?**

☐ ... Yes ⟶ How many times? _____

☐ ... No

7.9 **Other than experiences described in the previous item, has anyone ever used PHYSICAL FORCE OR THREAT to <u>TRY</u> to make you have intercourse, oral or anal sex, against your wishes OR when you were in some way helpless?**

☐ ... Yes ⟶ How many times? _____

☐ ... No

7.10 **Other than experiences mentioned in the previous two items, has anyone <u>EVER</u> ACTUALLY TOUCHED private parts of your body or made you touch theirs against your wishes, OR when you were in some way helpless?**

☐ ... Yes ⟶ How many times? _____

☐ ... No

7.11 **When you were a child, did a parent, caregiver or other person ever slap you REPEATEDLY, beat or otherwise attack or harm you?**

☐ ... Yes ⟶ How many times? _____

☐ ... No

7.12 **Other than the experiences mentioned in the previous item, have you ever been kicked, beaten, slapped around or otherwise physically harmed by a romantic partner, date, sibling, family member, stranger or someone else?**

☐ ... Yes ⟶ How many times? _____

☐ ... No

7.13 Other than the experiences already covered, has anyone ever THREATENED you with a weapon, like a knife or gun?

☐ ... Yes ⟶ How many times? _____

☐ ... No

7.14 Have you ever caused SERIOUS injury, harm, or death to someone else?

☐ ... Yes ⟶ How many times? _____

☐ ... No

7.15 Have you ever been present when another person was killed, seriously injured, or sexually or physically assaulted?

☐ ... Yes ⟶ How many times? _____

☐ ... Yes, but only on TV, a movie, a picture or on the internet

☐ ... No

7.16 Have you experienced repeated or extreme exposure to gruesome or horrifying details of another person's death, serious injury, or sexual violation (e.g., repeatedly witnessing body parts after a serious accident, disaster, or violent conflict; or repeatedly being exposed to the details of child abuse)?

☐ ... Yes

☐ ... No

a) If 'Yes', was it only on TV, a movie, a picture or on the internet?

☐ ... Yes ⟶ How many times? _____

☐ ... No

b) Was it related to your work or occupation?

☐ ... Yes ⟶ How many times? _____

☐ ... No

*** Please continue on the next page ***

7.17 **Have you ever been in any other situation where you were seriously injured or your life was in danger (e.g., involved in military combat or living in a war zone)?**

☐ … Yes ⟶ How many such events did you experience? _____

☐ … No

a) **If 'Yes', briefly describe the event(s):**

7.18 **The events listed below correspond to the stressful event items queried above. Please select ONE of the events that happened to you which <u>YOU</u> consider to be the worst.**

☐ … Life-threatening illness

☐ … Life-threatening accident

☐ … Natural disaster

☐ … Fire or explosion

☐ … Exposure to toxic substance

☐ … Physical force / weapon used in robbery or mugging

☐ … Family member / very close friend died

☐ … Physical force used to have sex

☐ … Physical force / threat to try to have sex

☐ … Childhood: touched your private body parts

☐ … Parent / caregiver physically harmed you

☐ … Partner / date, etc. physically harmed you

☐ … Threatened with a weapon

☐ … You caused injury, harm, death

☐ … Present when someone was killed, injured, assaulted

☐ … Repeated exposure to vivid trauma details

☐ … Other situation: seriously injured / life in danger

☐ … None

*If you ticked 'None', **SKIP to question 11.1 on page 28***

(Goodman et al., 1998; Gray et al., 2004)

Appendix 2.4; Survey Excerpt – Adverse Childhood Experiences Questionnaire

The following questions relate to your childhood experiences and your family life during your childhood. Please select the answer that comes closest to how you feel.

While you were growing up, during your first 18 years of life:

12.1 **Did a parent or other adult in the household often or very often… Swear at you, insult you, put you down, or humiliate you? Or Act in a way that made you afraid that you might be physically hurt?**

☐ … Yes ☐ … No

12.2 **Did a parent or other adult in the household often or very often… Push, grab, slap, or throw something at you? Or Ever Hit you so hard that you had marks or were injured?**

☐ … Yes ☐ … No

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12.3 **Did an adult or person at least 5 years older than you ever… Touch or fondle you or have you touch their body in a sexual way? Or Attempt or actually have oral, anal, or vaginal intercourse with you?**

☐ … Yes ☐ … No

12.4 **Did you often or very often feel that… No one in your family loved you or thought you were important or special? Or Your family didn't look out for each other, feel close to each other, or support each other?**

☐ … Yes ☐ … No

12.5 **Did you often or very often feel that … You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? Or Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?**

☐ … Yes ☐ … No

12.6 **Were your parents ever separated or divorced?**

☐ … Yes ☐ … No

12.7 **Was your mother or stepmother often or very often pushed, grabbed, slapped, or had something thrown at her? Or Sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard? Or Ever Repeatedly hit over at least a few minutes or threatened with a gun or knife?**

☐ … Yes ☐ … No

12.8 **Did you live with anyone who was a problem drinker or alcoholic, or who used street drugs?**

☐ … Yes ☐ … No

12.9 **Was a household member depressed or mentally ill, or did a household member attempt suicide?**

☐ … Yes ☐ … No

12.10 **Did a household member go to prison?**

☐ … Yes ☐ … No

**** Please continue on the next page ****

(Felitti et al., 1998)

Appendix 2.5; Survey Excerpt – Generalised Anxiety Disorder Scale and Patient Health Questionnaire

Section E – Health

The following questions relate to feelings and problems that you may have experienced over the previous 2 WEEKS. Please select the answer that best describes how you have been feeling.

Over the last 2 weeks, how often have you been bothered by any of the following problems?

		No at all	Several days	More than half the days	Nearly every day
17.1	Feeling nervous, anxious or on edge.	☐	☐	☐	☐
17.2	Not being able to stop or control worrying.	☐	☐	☐	☐
17.3	Worrying too much about different things.	☐	☐	☐	☐
17.4	Trouble relaxing.	☐	☐	☐	☐
17.5	Being so restless that it is hard to sit still.	☐	☐	☐	☐
17.6	Becoming easily annoyed or irritable.	☐	☐	☐	☐
17.7	Feeling afraid as if something awful might happen.	☐	☐	☐	☐
18.1	Little interest or pleasure in doing things.	☐	☐	☐	☐
18.2	Feeling down, depressed, or hopeless.	☐	☐	☐	☐
18.3	Trouble falling or staying asleep, or sleeping too much.	☐	☐	☐	☐
18.4	Feeling tired or having little energy.	☐	☐	☐	☐
18.5	Poor appetite or overeating.	☐	☐	☐	☐
18.6	Feeling bad about yourself - or that you are a failure or have let yourself or your family down.	☐	☐	☐	☐
18.7	Trouble concentrating on things, such as reading the newspaper or watching television.	☐	☐	☐	☐
18.8	Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual.	☐	☐	☐	☐
18.9	Thoughts that you would be better off dead or of hurting yourself in some way.	☐	☐	☐	☐

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GAD-7 (Spitzer et al., 2006)

PHQ-9 (Kroenke et al., 2001)

Appendix 2.6; Survey Excerpt – Suicidality Items

The following questions relate to your thoughts of hurting yourself. Please answer each question as best you can.

11.1 Did you <u>ever in your life</u> have thoughts of killing yourself?

☐ … Yes ☐ … No

a) If 'yes'… About how old were you the <u>very first time</u> you had thoughts of killing yourself?

Age at first time: _____

11.2 Did you ever wish you were dead or would go to sleep and never wake up?

☐ … Yes ☐ … No

a) If 'yes'… About how old were you the <u>very first time</u> you had that wish?

Age at first time: _____

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11.3 **Did you ever think about how you might kill yourself *(e.g., taking pills, shooting yourself)* or work out a plan of how to kill yourself?**

☐ … Yes ☐ … No

a) **If 'yes'… About how old were you the very first time you thought about how you would kill yourself or worked out a plan?**

Age at first time: _____

11.4 **People who think about killing themselves or wanting to be dead sometimes do dangerous things as a way to tempt fate *(e.g. take a lot of drugs, drive too fast, volunteer for dangerous missions, or act recklessly).* How often in your life did you ever do dangerous things RELATED to thinking about killing yourself or wanting to be dead?**

☐ … Very often

☐ … Often

☐ … Sometimes

☐ … Rarely

☐ … Never

☐ … Not applicable – I never thought about killing myself and never wished I was dead

11.5 **Have you ever made a suicide attempt *(i.e., purposefully hurt yourself with at least some intent to die)*?**

☐ … Yes ☐ … No

a) **If 'yes'… About how old were you the very first time you made a suicide attempt?**

Age at first time: _____

b) **If 'yes'… How many different suicide attempts have you ever made?**

Number of attempts: _____

c) **If 'yes'… How many different suicide attempts have you made in the past year?**

Number of attempts: _____

*** Please continue on the next page ***

11.6 **Did you ever do something to hurt yourself on purpose, <u>without</u> wanting to die *(e.g., cutting yourself, hitting yourself, or burning yourself)?***

☐ ... Yes ☐ ... No

a) **If 'yes'... About how old were you the <u>very first time</u> you did something to hurt yourself on purpose, without wanting to die?**

Age at first time: _____

b) **If 'yes'... About how many times <u>in your life</u> did you do something to hurt yourself on purpose, <u>without</u> wanting to die?**

☐ ... 1 - 2 times
☐ ... 3 - 5
☐ ... 6 – 10
☐ ... 11 - 20
☐ ... 21 – 30
☐ ... 31 – 50
☐ ... 51 – 100
☐ ... 101 or more times

c) **If 'yes'... About how many times <u>in the past year</u> did you do something to hurt yourself on purpose, <u>without</u> wanting to die?**

☐ ... 0 times
☐ ... 1 – 2 times
☐ ... 3 – 4
☐ ... 5 - 10
☐ ... 11 - 20
☐ ... 21 – 30
☐ ... 31 – 50
☐ ... 51 – 100
☐ ... 101 or more times

Items 11.1 and 11.5 are used as indicators of Suicidality in *Chapter 7*.

(Bunting et al., 2012)

Appendix 3.0; Missing Data Analysis of Chapter 3 Sample

	Shapiro-Wilk Test			Mann-Whitney U	
	W	df	*p*	*U*	*p*
ITQ1	.832	357	< .001	2479.00	.958
ITQ2	.843	357	< .001	2190.00	.417
ITQ3	.831	357	< .001	2203.50	.446
ITQ4	.822	357	< .001	2366.00	.726
ITQ5	.850	357	< .001	2341.00	.682
ITQ6	.829	357	< .001	2341.50	.873
ITQ7	.808	357	< .001	2380.50	.752
ITQ8	.757	357	< .001	1667.00	.701
ITQ9	.788	357	< .001	1643.00	.648
ITQ10	.875	357	< .001	437.50	.174
ITQ11	.856	357	< .001	438.00	.581
ITQ12	.806	357	< .001	341.00	.909
ITQ13	.788	357	< .001	302.50	.694
ITQ14	.847	357	< .001	486.50	.779
ITQ15	.855	357	< .001	468.50	.223
ITQ16	.800	357	< .001	590.00	.534
ITQ17	.754	357	< .001	91.50	.364
ITQ18	.777	357	< .001	86.00	.340

Note: W = Shapiro-Wilk Test Statistic, df = Degrees of Freedom, U = Mann-Whiney U Test Statistic, ITQ = International Trauma Questionnaire.

Appendix 3.1; Missing Data Analysis of Chapter 4 Sample

	Shapiro-Wilk Test			Mann-Whitney U	
	W	df	*p*	*U*	*p*
ITQ					
ITQ1	.832	357	< .001	2479.0	.958
ITQ2	.843	357	< .001	2190.0	.417
ITQ3	.831	357	< .001	2203.5	.446
ITQ4	.822	357	< .001	2366.0	.726
ITQ5	.850	357	< .001	2341.0	.682
ITQ6	.829	357	< .001	2341.5	.873
ITQ7	.808	357	< .001	2380.5	.752
ITQ8	.757	357	< .001	1667.0	.701
ITQ9	.788	357	< .001	1643.0	.648
ITQ10	.875	357	< .001	437.5	.174
ITQ11	.856	357	< .001	438.0	.581
ITQ12	.806	357	< .001	341.0	.909
ITQ13	.788	357	< .001	302.5	.694
ITQ14	.847	357	< .001	486.5	.779
ITQ15	.855	357	< .001	468.5	.223
ITQ16	.800	357	< .001	590.0	.534
ITQ17	.754	357	< .001	91.5	.364
ITQ18	.777	357	< .001	86.0	.340
PCL-5					
PCL1	.872	357	< .001	4519.50	.002
PCL2	.823	357	< .001	5093.00	.062
PCL3	.793	357	< .001	4971.00	.016
PCL4	.873	357	< .001	4788.00	.009
PCL5	.839	357	< .001	4776.50	.026
PCL6	.851	357	< .001	5038.00	.074
PCL7	.832	357	< .001	5320.50	.074
PCL8	.742	357	< .001	5422.00	.247
PCL9	.822	357	< .001	4990.50	.019
PCL10	.806	357	< .001	4744.00	.012
PCL11	.826	357	< .001	4881.00	.013
PCL12	.837	357	< .001	5155.50	.039
PCL13	.851	357	< .001	5546.00	.157
PCL14	.834	357	< .001	5506.50	.212
PCL15	.860	357	< .001	4714.50	.006
PCL16	.777	357	< .001	4977.00	.015
PCL17	.863	357	< .001	5655.00	.141
PCL18	.841	357	< .001	5903.50	.393
PCL19	.851	357	< .001	5080.00	.031
PCL20	.851	357	< .001	6109.00	.580
CAPS1	.776	357	< .001	5344.00	.066
CAPS2	.775	357	< .001	5561.00	.138

Note: W = Shapiro-Wilk Test Statistic, df = Degrees of Freedom, U = Mann-Whiney U Test Statistic, ITQ = International Trauma Questionnaire, PCL = PTSD Checklist, CAPS = Clinician Administered PTSD Scale.

Appendix 3.2; Missing Data Analysis of Chapter 5 Sample

	Shapiro-Wilk Test			Mann-Whitney U	
	W	df	*p*	*U*	*p*
ITQ1	.832	357	< .001	2479.00	.958
ITQ2	.843	357	< .001	2190.00	.417
ITQ3	.831	357	< .001	2203.50	.446
ITQ4	.822	357	< .001	2366.00	.726
ITQ5	.850	357	< .001	2341.00	.682
ITQ6	.829	357	< .001	2341.50	.873
ITQ7	.808	357	< .001	2380.50	.752
ITQ8	.757	357	< .001	1667.00	.701
ITQ9	.788	357	< .001	1643.00	.648
ITQ10	.875	357	< .001	437.50	.174
ITQ11	.856	357	< .001	438.00	.581
ITQ12	.806	357	< .001	341.00	.909
ITQ13	.788	357	< .001	302.50	.694
ITQ14	.847	357	< .001	486.50	.779
ITQ15	.855	357	< .001	468.50	.223
ITQ16	.800	357	< .001	590.00	.534
ITQ17	.754	357	< .001	91.50	.364
ITQ18	.777	357	< .001	86.00	.340

Note: W = Shapiro-Wilk Test Statistic, df = Degrees of Freedom, U = Mann-Whiney U Test Statistic, ITQ = International Trauma Questionnaire.

Appendix 3.3; Missing Data Analysis of Chapter 6 Sample

	χ2	df	*p*
SLESQ	0.001	1	.977
SLESQ1	0.116	1	.684
SLESQ2	0.184	1	.700
SLESQ3	0.893	1	.345
SLESQ4	0.236	1	.627
SLESQ5	0.078	1	.708
SLESQ6	0.017	1	.895
SLESQ7	0.727	1	.394
SLESQ8	0.504	1	.478
SLESQ9	1.071	1	.301
SLESQ10	0.023	1	.881
SLESQ11	4.117	1	.052
SLESQ12	0.310	1	.578
SLESQ13	0.080	1	.778
SLESQ14	0.431	2	.806
SLESQ15	1.377	1	.241
SLESQ16	0.613	1	.434
SLESQ17	20.00	16	.220
Home Service			
UDR/R. Irish	2.805	1	.094

Note: χ2 = Chi-Square, df = Degrees of Freedom, SLESQ = Stressful Life Events Screening Questionnaire, UDR = Ulster Defence Regiment.
N.B. Insufficient cell observations for items of the Adverse Childhood Experiences Questionnaire in this sub-sample therefore comparisons were not possible.

Appendix 3.4; Missing Data Analysis of Chapter 7 Sample

	Shapiro-Wilk Test			Mann-Whitney U	
	W	df	*p*	*U*	*p*
ITQ					
ITQ1	.832	332	< . 001	5630.00	.667
ITQ2	.840	332	< . 001	5667.00	.715
ITQ3	.827	332	< . 001	5498.00	.530
ITQ4	.817	332	< . 001	5441.00	.451
ITQ5	.850	332	< . 001	5751.00	.827
ITQ6	.827	332	< . 001	5313.50	.488
ITQ7	.805	332	< . 001	5792.00	.879
ITQ8	.754	332	< . 001	5386.50	.616
ITQ9	.786	332	< . 001	5540/50	.828
ITQ10	.875	332	< . 001	4055.00	.787
ITQ11	.854	332	< . 001	3952.00	.887
ITQ12	.807	332	< . 001	3655.50	.437
ITQ13	.787	332	< . 001	3838.50	.696
ITQ14	.848	332	< . 001	3984.50	.921
ITQ15	.855	332	< . 001	4184.50	.975
ITQ16	.798	332	< . 001	3910.50	.561
ITQ17	.753	332	< . 001	3365.50	.163
ITQ18	.773	332	< . 001	3709.00	.530
PHQ					
PHQ1	.801	332	< . 001	5994.50	.535
PHQ2	.807	332	< . 001	5559.50	.178
PHQ3	.825	332	< . 001	5268.00	.070
PHQ4	.831	332	< . 001	5435.50	.119
PHQ5	.781	332	< . 001	5611.00	.192
PHQ6	.760	332	< . 001	5462.50	.114
PHQ7	.798	332	< . 001	5076.50	.029
PHQ8	.699	332	< . 001	5875.50	.356
PHQ9	.623	332	< . 001	4880.50	.003
GAD					
GAD1	.809	332	< . 001	5998.50	.522
GAD2	.797	332	< . 001	6328.00	.951
GAD3	.826	332	< . 001	6120.00	.663
GAD4	.814	332	< . 001	6120.50	.663
GAD5	.799	332	< . 001	6035.00	.559
GAD6	.841	332	< . 001	5886.50	.412
GAD7	.747	332	< . 001	5726.50	.265
Suicidality					
Ideation[a]	-	-	-	6.17 (1)[a]	.013
Attempt[a]	-	-	-	1.50 (1)[a]	.220

[a] *Binary variables compared using Chi-square test of independence.*

Note: W = Shapiro-Wilk Test Statistic, df = Degrees of Freedom, U = Mann-Whiney U Test Statistic, ITQ = International Trauma Questionnaire, PHQ = Patient Health Questionnaire, GAD = Generalised Anxiety Disorder Scale.

Appendix 4.0; Multicollinearity Statistics for Chapter 6 Predictor Models

	VIF	Tolerance
Model 1		
SLESQ1	1.06	.95
SLESQ2	1.14	.88
SLESQ3	1.12	.90
SLESQ4	1.24	.80
SLESQ5	1.14	.88
SLESQ6	1.17	.85
SLESQ7	1.15	.87
SLESQ8	1.77	.57
SLESQ9	1.70	.59
SLESQ10	2.23	.45
SLESQ11	1.23	.81
SLESQ12	1.29	.78
SLESQ13	1.34	.75
SLESQ14	1.22	.82
SLESQ15	1.48	.67
SLESQ16	1.47	.68
SLESQ17	1.33	.75
Model 2		
ACE1	3.12	.32
ACE2	2.73	.37
ACE3	1.16	.86
ACE4	1.78	.56
ACE5	1.36	.74
ACE6	1.23	.81
ACE7	1.41	.71
ACE8	1.27	.79
ACE9	1.19	.84
ACE10	1.16	.86
Model 3		
Home Service	1.00	.99
Total Lifetime Trauma	1.23	.81
Total Childhood Adversity	1.23	.82

Note: SLESQ = Stressful Life Events Screening Questionnaire, ACE = Adverse Childhood Experiences Questionnaire.