THE RELATIONSHIP BETWEEN POSTTRAUMATIC STRESS DISORDER (PTSD) AND GENERAL VIOLENCE AS WELL AS DOMESTIC VIOLENCE AND ABUSE (DVA)

By

NICOLA CHRISTINE SCHAUM

A thesis submitted to the University of Birmingham

for the degree of

Doctorate in Forensic Psychology Practice (ForenPsyD)

Centre of Applied Psychology

College of Life and Environmental Sciences

University of Birmingham

United Kingdom

July 2020

In liebevoller Erinnerung an Papa

Abstract

This thesis explores the relationship between Posttraumatic Stress Disorder (PTSD) and violence in the general population, as well as violence specifically towards an intimate partner or family member within military populations.

Aetiological factors contributing to the development of PTSD following exposure to a traumatic event as well as current assessment practices for PTSD are outlined. Development of the Clinician Administered PTSD Scale (CAPS) is discussed, highlighting that despite its widespread use in clinical practice, it has not been validated within non-military populations. This is followed by a meta-analysis of literature which has considered the association between individuals with and without PTSD who have engaged in violence towards anyone who is not an intimate partner or family member. The aim of the meta-analysis was to pool prevalence rates of violence within PTSD samples. Pooled rates suggest much higher rates of violence within PTSD samples compared to non-PTSD samples than reported in individual studies. Due to high levels of heterogeneity between the samples and violence measures, however, caution is advised in generalising these findings. The meta-analysis highlighted the highest prevalence of violence to occur within military PTSD samples. A systematic review was therefore conducted to explore this further and extant literature was collated to examine the relationship between PTSD and Domestic Violence and Abuse (DVA) within military samples. It was not possible to calculate the relative risk (RR) of perpetrating DVA for those with PTSD as the numerical data required for these calculations was not consistently reported in the literature. The majority of data was collected from help-seeking clinical samples, limiting generalisability to the wider veteran population, particularly as existing research has emphasised that the time between military service discharge and presenting at a PTSD treatment clinic spans a number of years.

Implications of the discussed findings as well as avenues for future research are discussed.

Acknowledgments

I would like to thank my academic supervisor, Dr Zoe Stephenson, for her continued support since starting my doctorate course, some three and a half years ago. She has been compassionate and understanding and allowed me the autonomy I required to complete my research.

I am extremely grateful to my best friend, my mother, who has taken on the role of research assistant, doctor, bank, accountant, and counsellor throughout the duration of this course. Thank you for going on this journey with me, I could not have asked for a better travel companion.

My gratitude extends to my grandfather, who financially supported me throughout all of my academic career. Without you I would not have been able to have come as far as I did – Danke, Opa.

Thank you also to Dr Sian Watson and Dr Christopher Jones for your academic guidance and practical insight!

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CHAPTER ONE:

INTRODUCTION

Introduction

The effects of a traumatic experience can be severe and exposure to a traumatic experience has been reported amongst 40% to 90% of the general population (Broeckman et al., 2007). Foa et al.'s (2013) study indicated that people who meet the diagnostic threshold for PTSD following a traumatic experience such as, for example, sexual assault or a serious motor vehicle accident, experienced a noteworthy reduction of symptoms after four months. This suggests that the majority of individuals who experience a traumatic event will experience a decrease in symptoms associated with the trauma whilst others will experience these symptoms for a longer period of time.

Posttraumatic Stress Disorder (PTSD)

Historical Overview

PTSD symptoms were initially captured through informal terminology such as 'shell shock' or 'combat fatigue' following World War I (Crocq & Crocq, 2000). About 30% of soldiers who had been deployed during the Vietnam War displayed symptoms, which would now be considered to be associated with PTSD, prompting the enunciation of a formally recognised disorder (Dadic-Hero et al., 2009; Foa et al., 2013; Friedman et al., 2010). Consequently, PTSD was included in the third version of the diagnostic and statistical manual of mental disorders (DSM-3), though was identified in conjunction with the specific trauma experienced such as, for instance, "battered women syndrome" if someone experienced partner abuse (Friedman et al., 2010).

In 2013, the fifth version of the diagnostic and statistical manual of mental disorders (DSM-5; American Psychiatric Association, 2013) was introduced. A key change concerned the classification of PTSD as an anxiety disorder in DSM-4 to a "Trauma- and Stressor-related Disorder" in DSM-5 (Shalev et al., 2017). In this respect, Friedman et al. (2010) have argued that because PTSD symptoms can vary between individuals who suffer from it, viewing it as a disorder of anxiety would not sensibly and thoroughly describe the pathology of PTSD. A further major change from previous DSM versions is the inclusion of two subtypes of PTSD. Firstly, PTSD that is accompanied with symptoms of dissociation such as feeling disconnected from one's own body or external world. Secondly, diagnostic criteria have been identified in respect of PTSD in children below the age of six years (APA, 2013). The US Department of Veterans Affairs (2013) noted a rise in PTSD diagnosis in young children when developmental criteria were considered. This suggests that behavioural measures of PTSD play a role when diagnosing children who are premature in cognition and verbal expressions. For a review of PTSD in children see Kirsch et al. (2011) and Dowd and McGuire (2011). These changes relating to the diagnostic criteria of PTSD for the DSM-5 are essential to the advancement of mental health services and PTSD assessment.

Clinical Presentation

The development of PTSD must result from direct experiencing of actual or threatened death, serious injury, or a threat to the physical integrity of others (Friedman et al., 2010). With the revision of the DSM-5, this now extends to the exposure to aversive details of a traumatic event within an individual's professional responsibilities, for example, individuals who investigate forensic child abuse (Pai, Suris, & North, 2017). The disorder develops as a result of intense psychological distress experienced during, for example, military combat,

bereavement, sexual assault including rape, automobile or plane crashes (Ryb et al., 2009), natural disasters (Arnberg et al., 2013; Yager 2012) and fires (Shalev et al., 2017). Situations like these will undoubtedly pose a greater threat than stress experienced on a daily basis, which can result in experiencing overwhelming and prolonged anxiety. The DSM-5 clusters PTSD symptoms into four distinct categories, thus adding a symptom group to the three retained from the previous DSM-4 classification: re-experiencing, avoidance, negative cognitions and mood [new], and arousal (APA, 2013). Re-experiencing the traumatic experience through spontaneous recall, recurring dreams and/or flashbacks represents symptoms of PTSD. In addition, individuals with PTSD may try to avoid external reminders and any other memories possibly related to the traumatic index event. Individuals may also lose interest in daily activities and/or are unable to remember key information relating to the traumatic event. Another common feature of PTSD may be distancing oneself from friends and family and continued emotional arousal may be expressed through aggression, irritation, problems with sleeping and hypervigilance, for instance, being startled easily by unexpected noises (Oltmanns & Emery, 2012). In addition, blaming oneself or others for causing the traumatic event as well as self-destructive behaviour, and/or experiencing emotions such as fear, anger, or shame as a direct result of the trauma are symptoms that have been added to the DSM-5 PTSD classification (APA, 2013). Essentially, the DSM-5 places greater emphasis on behavioural responses of individuals who suffer from PTSD, rather than passive behavioural symptomatology.

Individuals who are considered for a diagnosis of PTSD must experience at least one active symptom pertaining to the avoidance cluster, symptoms must persist for longer than a month and must impair an individual's functioning in their occupational and social life. For example, symptoms could lead to instability in an individual's intimate relationships and

parenting skills (Ramsden, 2013; Sherman et al., 2016). In contrast to Acute Stress Disorder (ASD), symptoms associated with PTSD can have a delayed onset, that is, they can appear months after exposure to a traumatic experience. In addition, the experience of trauma can persist over time with an individual struggling to adapt and manage reactions to acute stress (Friedman et al., 2010; Oltmanns & Emery, 2012; Ramsden, 2013). However, the development of PTSD is influenced by individual differences and prior life experiences (Ramsden, 2013), and lack of access to education and mental health services as well as childhood abuse (Ullman & Brecklin, 2002) can influence the processing of trauma.

Prevalence

Prevalence rates recorded for Posttraumatic Stress Disorder (PTSD) have been found to vary between nations with prevalence rates of 20.4% for females and 8.2% for males in the US general population (Foa et al., 2013) and 3% in the UK general population (Greenberg et al., 2015). Furthermore, prevalence rates reported in different studies also vary with another study of an American population reporting a PTSD prevalence rate of 5% for men and 10% for women (Bisson, 2010); this is likely as a result of methodological variance between study designs. More recent figures suggest that probable PTSD in the UK civilian population was 4.4% (KCMHR, 2018) and 6.2% for UK veterans and serving personnel in 2014 to 2016 (Stevelink et al., 2018). Amongst individuals who served in the UK Armed Forces, the KCMHR cohort study (2018) found that the prevalence rate of PTSD was higher for those who had seen combat (6%) versus those who held a support role (4%) during their military deployment. In respect of US military samples, the lifetime prevalence of PTSD for Vietnam veterans was 30.9% for males and 29.6% for females (Kulka et al., 1990), and 13.8% for veterans who served during the Iraq and Afghanistan wars (Kang et al., 2003).

Research suggests that men are susceptible to develop PTSD after combat exposure whereas rape may be a common cause of PTSD in females (Oltmanns & Emery, 2012). Oltmanns and Emery (2012) also note that the most common cause of PTSD is due to bereavement following the unexpected loss of a loved one. Moreover, women are generally more likely to develop PTSD than men (Drury & Henry, 2012). Oltmanns and Emery (2012) suggested that two to four out of 10 affected children are extremely vulnerable to developing PTSD after having experienced trauma. Furthermore, trauma experienced during childhood such as: childhood abuse; accidents; invasive medical procedures; and natural disasters, may increase the risk of developing PTSD as an adult (Mahan & Ressler, 2011; Ramsden, 2013; US Department of Veterans Affairs, 2013).

Aetiology of PTSD

The development of PTSD requires an "aetiological agent" (i.e., trauma; Broeckman et al., 2007, p. 349), however, latent biological propensities, neurological as well as psychological factors may also conduce to the development of PTSD.

Biological Propensities

As previously emphasised, not every individual who experiences trauma will develop PTSD, suggesting some individuals have an increased vulnerability for developing PTSD (Breslau et al., 2013). In this respect, epidemiological studies showed that identical twins were at greater risk of developing PTSD compared to dizygotic twins after being exposed to military combat during the Vietnam War (Broeckman et al., 2007; Oltmanns & Emery, 2012). Furthermore, Yehuda et al. (2005) studied babies of women who had been pregnant during

the 9/11 attack and who were therefore exposed to elevated stress levels whilst pregnant. Both the mothers (who later developed PTSD) as well as their babies were found to have decreased cortisol levels. This suggests that changes in the biology of parents during prenatal PTSD may be transferred in utero and may affect foetal brain development, which Yehuda et al. (2005) termed as "transgenerational transmission" of PTSD vulnerability. It is useful to clarify that, in response to acute stress, cortisol is released to increase heart rate and blood pressure and temporarily inhibits bodily functions such as digestion which are not essential during a fight-or-flight response (Hannibal & Bishop, 2014). In PTSD, however, Young and Breslau (2004) highlighted a "paradoxical cortisol profile" (p. 394) as ordinarily higher levels of cortisol would be expected during a stress response. Indeed, a number of studies have since noted lower cortisol levels in PTSD samples (Morris et al., 2012; Wahbeh & Oken, 2013; Yehuda et al., 2008). Interestingly, heritability of PTSD has been found to be in the percentile range of 30% (Johnson et al., 2012; Mehta & Binder, 2012).

Furthermore, Kolassa et al. (2010a) found that genetic predispositions for PTSD may interact with environmental triggers, that is to say, the chance for developing PTSD accumulates as a result of multiple traumas and may magnify any corresponding symptoms, which Kolassa et al. (2010b) termed as the "dose-response relationship". However, this appears to be relevant for only some individuals; Kolassa et al. (2010a) assessed survivors of the Rwandan genocide and found that individuals who had the shorter allele version of the SLC6A4 gene[1] were at increased risk of developing PTSD *regardless* of their lifetime exposure to traumatic events.

To summarise, latent genetic propensities (such as those mentioned above), may interact with an individual's environment and augment the development of PTSD. Although

[1] This genotype is responsible for encoding serotonin reuptake transporters (Wang et al., 2019).

trauma will leave a mark on an individual, genetic and environmental factors may explain why some are more vulnerable to develop this disorder compared to others and why the expression of PTSD may vary between individuals.

Neurological Factors

Considering the impact of trauma on the brain, Dickie et al. (2008) noted reduced activity of the hippocampus and medial prefrontal cortex (related to encoding and retrieval of memory (Jin & Maren, 2015)) when looking at neuroimages of individuals with PTSD compared to those who did not have PTSD. Yehuda and LeDoux (2007) go as far as suggesting that a smaller hippocampus may indicate an increased vulnerability to develop PTSD. Moreover, Nutt and Malizia (2004) observed increased activity in the amygdala in response to fearful stimuli in those suffering from PTSD compared to control subjects; the amygdala is associated with learned fear (Fanselow & LeDoux, 1999) such as that associated with Pavlovian fear conditioning (Mahan & Ressler, 2011). Similarly, research which has explored whether symptoms characteristic of PTSD (e.g., re-experiencing of the trauma, hypervigilance, emotional arousal and distress) are caused by affected functionality of the brain regions also known as the limbic system (Mahan & Ressler, 2011), upholds the notion of a hypersensitive fight-or-flight response as a result of increased reactivity when exposed to stimuli that is considered threatening (Oltmanns & Emery, 2012; Rainnie & Ressler, 2009; Yehuda & LeDoux, 2007).

It has further been suggested that neuroendocrine responses to psychological stress, that is, the release of hormones into the body in order to cope with the physiological demand of stress (Miller & O'Callaghan, 2002), play a role in PTSD. For example, it has been suggested that dysfunctional signalling of the neuroendocrine BDNF (Brain Derived

Neurotropic Factor) found in PTSD patients, as well as mice placed in stressful settings, has been associated with impaired synaptic plasticity, and specifically, an inability to extinguish conditioned (or learned) fear (Mahan & Ressler, 2011). Additionally, GABAergic microcircuits have been identified as another molecular mechanism implicated in the learning of fear (Mahan & Ressler, 2011), particularly, due to an increased activation of GABAergic microcircuits which, similar to BDNF, has been linked to difficulty in erasing fear memory (Fang et al., 2018). Both the GABAergic microcircuit and the BDNF pathway underpin Pavlovian fear conditioning, which has been described to resemble the psychopathology underlying PTSD (Mahan & Ressler, 2011). Commonly, the immune system adapts to stress or "disruptions in homeostasis" (Miller & O'Callaghan, 2002, p. 1), though extreme and prolonged distress may result in inflammation and lead to the development of disease (Miller & O'Callaghan, 2002). Indeed, Baker et al. (2012) reviewed evidence that suggests increased inflammation is associated with PTSD, and Uddin et al. (2010) found that trauma altered the genetic transcription of genes responsible for immune functioning.

In summary, prolonged psychological stress may strain the nervous system to such an extent that it leads to inflammation. Although research suggests that trauma may contribute to the aforementioned physiological changes, Oltmanns and Emery (2012) rightly highlight that whilst such changes correlate with the development of PTSD, they are not necessarily the cause of the disorder.

Psychological Predispositions

Some research has suggested that the development of PTSD may be prejudiced by 'vulnerable' personality traits or passive (compared to active) coping mechanisms (Ramsden, 2013; Stein et al., 2002). For instance, neuroticism has been associated with the development

of PTSD (Breslau & Schultz, 2012; Ogle et al., 2016) as individuals with marked levels of this trait may, by virtue of their personality make up, experience higher levels of arousal and irritability following exposure to a traumatic experience. Furthermore, existing mental health difficulties may increase the risk of developing PTSD (Ramsden, 2013) as, for example, depression or alcohol abuse are commonly present in individuals with PTSD (Dadic-Hero et al., 2009). Indeed, up to 80% of people with PTSD have a comorbid mental health diagnosis (Foa et al., 2009), which can challenge efforts to diagnose and treat PTSD. However, as already alluded to during the consideration of neurological factors, others argue that a prevalent psychological factor in the development of PTSD symptoms is Pavlovian fear conditioning (Mahan & Ressler, 2011; Oltmanns & Emery, 2012). This implies that fear experienced during a traumatic experience is manifested and PTSD sufferers 'learn' to affix responses of fear to general and, in fact, 'harmless' situations. For example, when a specific noise is heard which was present during the experience of the trauma, though it may be considered as neutral in another context, it may trigger a conditioned response, e.g., a startle or shivering. Therefore, avoiding the stimulus reduces the re-experiencing of emotions or sensations experienced during the traumatic event. Normally, when a conditioned stimulus (neutral object) is continually presented without the unconditioned stimulus, the fear memory should become extinct. However, as previously noted, it has been suggested that this process (promoted by synaptic plasticity) is impaired in individuals who suffer from PTSD (Johnson et al., 2012). In addition, a cognitive model has been suggested in respect of the maintenance of PTSD over time (Ehlers & Clark, 2000), which emphasises the negative re-appraisal of a traumatic event, producing a sense of current threat. For example, rather than accepting that a trauma was experienced, individuals may negatively appraise this as "I attract disaster" (Ehlers & Clark, 2000, p. 322), reinforcing a state of fear/threat and symptoms pertaining to

the avoidance symptom cluster. In addition, the authors highlight that physiological sensation or physical cues such as smells, light patterns or spoken words may reinforce the traumatic experience, even if the individual is unable to recall the index trauma. In turn, not being able to remember details of the event, may be negatively appraised as the trauma being worse than it was, or that the individual was responsible for it or suffered brain damage as a result of it (Ehlers & Clark, 2000). In summary, the model highlights a strong cognitive influence on the maintenance of PTSD symptomatology and may further impede the extinction process of learned fear memory, as described above. For a detailed description of the cognitive model for PTSD see Ehlers and Clark (2000).

Summary

Although symptoms of PTSD were first noted after the First World War, a formal classification of PTSD occurred only with the revision of DSM-3 in 1980. This has since been revised to consider factors that have emerged following treatment and therapy yielding current diagnostic criteria as per DSM-5.

Research suggests that 7% to 12% of individuals who experience a traumatic experience develop the full spectrum of PTSD as they have difficulties in restoring physiological balance after experiencing trauma (Yehuda & LeDoux, 2007). As discussed, there are various aspects to an individual's biological, psychological or environmental make up that may influence the development of PTSD, resulting in some individuals struggling to recover from the effects of trauma.

PTSD is no longer simply considered a disorder of anxiety, yet some researchers have postulated whether it should be considered a disorder of information processing. In this respect, Schubert and Lee (2009) emphasise that anxiety is not caused due to the traumatic

experience per se but rather due to inadequate encoding and recalling of the memories pertaining to the trauma. In light of the reviewed research, it appears that the main distinction between PTSD sufferers and non-sufferers is the inability to adapt and cope with an experience of trauma as a result of biological or neurological limitations. As previously suggested, most individuals will process stress over time through adaptive processing of information. It appears that individuals who suffer from PTSD, however, continue to be grounded in a prolonged state of distress as negative memories are not appropriately processed and, instead, are kept active in conscious experience.

Implications of PTSD

Symptoms of PTSD can have, if untreated, grave consequences for the sufferer. In this respect, PTSD has been associated with physical illness and premature death (Schlenger et al., 2015); suicidal ideation (Sareen et al., 2007) and completed suicide (Kotler et al., 2001). O'Toole et al. (2003) found that in a US cohort of homeless adults, more than 60% reported psychiatric problems and/or chronic medical conditions and almost 80% of the sample indicated alcohol or substance dependence. It is of note, that these difficulties are also significant risk factors for homelessness in the general population (Shelton et al., 2009). Accordingly, mental ill health may contribute to the risk of becoming homeless, whilst the lived experience of homelessness may also strain someone's mental wellbeing. Furthermore, as observed with psychiatric patients (Angermeyer, 2000; Talamo et al., 2006), veterans may also use drugs and alcohol to self-medicate in an attempt to control the symptoms of PTSD. Additionally, Langston et al. (2007) highlight that stigma is experienced in the general population in respect of seeking help for mental health difficulties, which has been evidenced

during treatment and after treatment discharge. A discrediting social attitude towards mental illness has been found to perpetuate stigma towards psychological problems and has thus resulted in higher rates of engagement for medical treatments compared to referrals made for psychological interventions (Britt, 2000). Treatment of PTSD may be time consuming as one needs to consider cognitive, physiological, and environmental factors as well as dysfunctional behavioural strategies that maintain PTSD (Ehlers & Clark, 2000). Furthermore, perpetration of violence and expression of aggression has also been related to symptoms of PTSD, and is explored, in detail, within two distinct chapters of this thesis.

Aims of the Thesis

One aim of this thesis is to take an in-depth look at the current practice of assessing PTSD and how this has developed over time in conjunction with the development of our nosological understanding of PTSD. The second aim of this thesis is to explore PTSD in the context of violence against intimate partners and family members, as well as other persons not falling into the category of Domestic Violence and Abuse (DVA). To address this, three distinct pieces of work have been carried out:

- Chapter two explores the development of the Clinician Administered PTSD Scale (CAPS) which is widely used by practitioner to assess and diagnose PTSD. A critical review of the psychometric properties of the fifth and most recent version of the tool (CAPS-5) is presented and implications for practitioners are discussed.
- Chapter three presents a meta-analysis of extant literature that measured PTSD and violence in any population. Event rates were extracted from systematically chosen

studies and pooled to yield an overall estimate of risk of general violence amongst those with PTSD.

- Following the information identified in chapter three, chapter four expands on this and takes a closer look at violence amongst military populations with PTSD; in particular, DVA perpetration. A systematic literature review of existing literature was carried out to explore whether PTSD may be considered a risk factor for violence against a family member or intimate partner amongst active and/or veteran military personnel.

Furthermore, Chapter five summarises the findings presented within the above-mentioned chapters and aims to incorporate this within extant literature related to PTSD and violence. Clinical implications of the discussed findings and limitations of the thesis are explored and avenues for future research are identified.

CHAPTER TWO:

THE CLINICIAN-ADMINISTERED PTSD SCALE (CAPS-5): A REVIEW OF PRELIMINARY PSYCHOMETRIC PROPERTIES

Abstract

Objective

Clinical preference has been expressed for interview-based tools that allow for the dimensional assessment of Posttraumatic stress disorder (PTSD) compared to symptom checklists (Weathers et al., 1999). The Clinician-Administered PTSD scale (CAPS), initially developed by Blake et al. (1990) has been considered the "gold standard" for PTSD assessment. This review details the development of the CAPS and provides an overview as to how research into PTSD has impacted upon the tool and led to restructuring. This review examined the most recent version of the tool (CAPS-5), and its preliminary psychometric properties.

Results

To date, one study has validated the CAPS-5 using two US veteran samples establishing high internal reliability, good test-retest reliability, and excellent inter-rater reliability (Weathers et al., 2018). The CAPS-5 has been translated into German (Mueller-Engelmann et al., 2018) and Dutch (Boeschoten et al., 2018). Compared to the English tool, the German version demonstrated even stronger psychometric properties in a sample of female victims of physical and sexual childhood abuse. Using a psychiatric sample, the Dutch tool demonstrated good internal and inter-rater reliability though test-retest reliability and validity was not established.

Conclusions

Since the revision of the DSM-5, the CAPS-5 is widely used in research and practice for the assessment of PTSD, though its psychometric properties have not yet been thoroughly

reviewed. Initial psychometric validations of the tool suggest that it is robust in measuring the construct of PTSD, though further validation studies are needed to establish the English tool's validity and reliability across different trauma populations.

Structured Assessment of PTSD: An Overview

As mentioned in Chapter one, Posttraumatic Stress Disorder (PTSD) was initially included in the third edition of the "Diagnostic and Statistics Manual of Mental Disorders" (DSM III, American Psychiatric Association) in 1980. It is suggested that there are multiple reasons why it is important to formally assess PTSD. For example. Galatzer-Levy and Briant (2013) found that there are over 636,000 possible ways to meet criteria for PTSD due to possible symptom combinations having been expanded eightfold with the development of the most recent version of the DSM (5^{th} edition). This would imply the need for a formal assessment of the disorder to verify a specific trauma or diagnosis. Additionally, formal assessment allows for a baseline of PTSD which can be compared to a follow-up assessment post treatment, to identify how treatment may or may not have helped, which will be a useful treatment guideline for both the client and the clinician (Blake et al., 2000). A tool for assessment supports the clinician in formalising reasons as to why an individual meets the threshold for a PTSD diagnosis, i.e., the assessment is informed by an instrument rather than based solely on professional judgement. A tool can also help identify specific problem areas to address during therapy in order to tailor treatment to individual needs (NHS, 2018).

Prior to the CAPS, other structured interviews were available, for example, the Diagnostic Interview Schedule (DIS*;* Hendricks et al., 1983). However, the DIS was criticised for consisting of yes/no scoring for whether an individual experienced specific symptoms to inform a full diagnosis without follow-up questions or Likert scales (i.e., anchor ratings) used to rate symptom severity (Blake et al., 1995). Alternatively, the Structured Interview for PTSD (SI-PTSD; Davidson et al., 1990*)* and the PTSD Symptom Scale - Interview (PSS-I; Foa et al., 1993*)* were based on the DSM-III diagnostic criteria for PTSD. The SI-PTSD has

been criticised for not differentiating severity of symptoms in terms of frequency and intensity (Blake et al., 1995). The SI-PTSD rated each symptom based on when the severity was the ″worst ever″, which Blake et al. (1995) argued tended to inflate life time prevalence rates of PTSD, rather than highlight severity of symptoms over the last month (Blake et al., 1995). Additionally, the PSS-I has been criticised for measuring symptoms over a 2-week time frame, which does not correspond with diagnostic criteria of symptoms having to be present for at least one month to justify a full PTSD diagnosis (Blake et al., 1995). Similar to the DSI, the PSS-I did not promote additional prompts to explore individual symptoms. The SI-PTSD and the PSS-I provided anchor ratings, e.g., 0 = absent and 4 = extremely severe, but neither measure provided behavioural descriptors for the rating anchors that may help conceptualise symptom severity (Blake et al., 1995).

Early research suggested that PTSD assessments should: correspond with diagnostic criteria; provide dichotomous (yes/no) and continuous data (e.g., Likert scale) about each symptom; include behavioural descriptions of ratings; be usable by individuals trained in the tool (not just qualified clinicians); possesses adequate reliability and validity; and distinguish between current and lifetime PTSD (i.e., the most symptomatic month following the trauma) (Blake, 1994; Blake et al., 1995; Blake et al., 2000). It was also argued that tools should consider severity of symptoms to be dimensional (e.g., frequency and intensity) as, for example, one patient may experience frequent but moderately intense PTSD symptoms, whereas another may experience infrequent but extremely intense symptoms (Blake, 1994). This was deemed important in observing PTSD symptoms across time, particularly when examining treatment change. Due to the Structured Interview for PTSD (1990) and the PTSD Symptom Scale – Interview (1993) not meeting all of these criteria, the first version of the CAPS was developed in 1990 (Blake et al., 1995).

Development of the CAPS

The CAPS was developed for clinicians and researchers who have a working knowledge of PTSD (Blake, 1994). The initial version of the CAPS was developed in 1990 at the National Centre for PTSD in the US. Since then, there have been four iterations of the tool. The first CAPS looked at symptoms over the past month, whereas a second version of the CAPS (Blake et al., 1994) looked at symptoms over the past week (instead of the previous month) and was primarily used for repeated assessments over relatively brief intervals (Blake, 1994). The next revision of the tool, CAPS-4, was aligned to DSM-IV criteria of PTSD and was introduced to assess multiple symptom time periods on the same scoring scale, therefore incorporating the symptom time frames from the previous CAPS versions (Blake et al., 1998). Additionally, a brief protocol for assessing exposure to a traumatic event was included in the tool, the *Life events checklist* (LEC). This consisted of a self-report checklist of potentially traumatic events and follow-up questions to help determine if the interviewee experienced a traumatic event as defined in DSM-IV (Weathers et al., 2001).

The CAPS-4 is one of the most widely scrutinised structured interview tools for PTSD (Weathers et al., 2001). The CAPS promotes uniform administration through clear and concise questions that include explicit behavioural anchors to reduce rating bias and enhance reliability (Blake et al., 1995). Initial prompt questions explicitly targeted each of the 17 PTSD symptoms as outlined in DSM-IV, and follow-up prompts helped interviewers collect more in-depth information. These features enhance standardisation across interviewers and ensure comparability of scores across diverse settings, administrators, and trauma populations (Weathers et al., 2001). The CAPS-4 has been found to have excellent psychometric properties with an internal consistency of $\alpha = .94$ when considering the 17 symptoms of the assessment; $\alpha = .90$ or greater are considered good for clinical tools (DeVon et al., 2007). It

has also been reported to have high test-retest reliability when the test was re-administered two to three days after initial assessment (κ = .90 - .98); κ = .75 or greater are considered high (Fleiss, 1981). The CAPS-4 additionally demonstrated strong convergent validity, with a correlation co-efficient of κ = .91 when compared to the Mississippi scale for combat-related PTSD. Overall, these findings are indicative of a strong measure (Taylor, 2004). Nonetheless, the most substantial revision of the CAPS is arguably the most recent one, where the CAPS was aligned to the DSM-5 (2013) diagnostic criteria of PTSD (Weathers et al., 2015), which led to some significant changes to PTSD diagnostic criteria.

Changes to PTSD Diagnostic Criteria in DSM-5

Pai et al. (2017) reviewed the changes made to the diagnostic criteria of PTSD with the development of the DSM-5. For the purpose of this review the most relevant changes to the CAPS-5 are presented. The DSM-5 acknowledges that more than one traumatic event can contribute to the development of PTSD (APA, 2013) and Kilpatrick et al. (2013) found this to be the norm in their sample of 2953 US adults. However, there were changes to the definition of trauma (Table 1, criterion A) in that items such as terminal illness or non-violent death no longer fall under this category, as the previous diagnostic criteria had been criticised for being too broad (Kilpatrick et al., 2013). Consequently, Kilpatrick et al. (2013) found 60% of individuals diagnosed with PTSD using the DSM-4 criteria, no longer qualified for this diagnosis under the DSM-5 criteria due to no longer meeting criterion A. Another significant change was in the number of overall symptoms and the number of symptom groups. According to DSM-5 diagnostic criteria, at least one avoidance symptom (Table 1) needs to be endorsed for the diagnosis of PTSD which was not the case in the previous DSM versions.

Kilpatrick et al. (2013) found that 37% of individuals meeting DSM-4 PTSD diagnosis did not meet DSM-5 diagnosis due to not reporting at least one active avoidance symptom. Furthermore, three additional symptoms were added (Table 1, items 10, 11, 16) (Pai et al., 2017) based on clinical observations of PTSD patient populations. However, North et al. (2016) suggested this indicates selection bias due to these symptoms appearing to be specific to PTSD subpopulations (e.g., psychiatric patients).

Table 1

Description of CAPS-5 items

CAPS-5 item	PTSD criteria and symptoms
	Criterion A: Traumatic event
	Criterion B: Re-experiencing symptoms
1	Recurrent, involuntary, and intrusive distressing memories of the traumatic event
2	Recurrent, distressing dreams in which the content and/or effect of the dream are related to the traumatic event (as identified for criterion A)
3	Dissociative reactions (e.g. flashbacks) in which the individual feels or acts as if the traumatic event were recurring
4	Intense of prolonged psychological distress at exposure to internal or external cues that symbolise or resembles an aspect of the traumatic event
5	Marked physiological reactions to internal or external cues that symbolise or resemble and aspect of the traumatic event

	Criterion C: Avoidance symptoms
6	Avoidance of distressing memories, thoughts, or feelings about or related to the traumatic event
7	Avoidance of or efforts to avoid external reminders (e.g., people, places, activities, objects) that arouse distressing memories, thoughts or feelings related to the traumatic experience
	Criterion D: Negative alterations in cognition and mood
8	Inability to remember an important aspect of the event (typically due to dissociative amnesia and not to other factors such as head injury, alcohol or drugs)
9	Persistent and exaggerated negative beliefs and expectations about oneself, others, or the world (e.g. “I am bad”, “no one can be trusted”, “world is completely dangerous”, “my whole nervous system is permanently ruined”).
10	Persistent, distorted cognitions about the course or consequences of the traumatic event that lead the individual to blame himself/herself or others
11	Persistent negative emotional state (e.g. fear, anger, horror, guilt or shame)
12	Markedly diminished interest or participation in significant activities
13	Feelings of detachment or estrangement from others
14	Persistent inability to experience positive emotions (e.g. inability to experience happiness, satisfaction or loving feelings)
	Criterion E: Alterations in arousal and reactivity

15	Irritable behaviour and angry outburst (with little or no provocation) typically expressed as verbal or physical aggression towards people or objects
16	Reckless or self-destructive behaviour
17	Hypervigilance
18	Exaggerated startle response
19	Problems with concentration
20	Sleep disturbance (e.g. difficulty staying or falling asleep or restless sleep)
	Criterion F: Disturbance of criteria B, C, D, E lasted at least a month
21	Onset of symptoms
22	Duration of symptoms
	Criterion G: Disturbance causing impairment in different areas of functioning
23	Subjective distress
24	Impairment in social functioning
25	Impairment in occupational or other important area of functioning
26	Global validity (consider compliance with interview, comprehension, concentration and malingering)
27	Global severity (consider degree of subjective distress, observation of behaviours during interview, and interviewee's judgment regarding own reporting style)
28	Global improvement (improvement since previous rating, degree of change and whether or not interviewer believes this is due to treatment)

	Dissociative symptoms
29	Depersonalisation (e.g. feeling as though one were in a dream, feeling as sense of unreality of self or body)
30	Derealisation (e.g. the world around the individual is experienced as unreal, dreamlike, distant, or distorted)

Note. CAPS-5 = Clinician administered PTSD Scale version 5. Table adapted from Blake et al. (2015).

Overview of the CAPS-5

In addition to ensuring items on the tool correspond with the updated DSM-5 PTSD criteria (Weathers et al., 2013c), revisions were made to the scoring of the previous version of the tool. Weathers et al. (2015) noted that some of the CAPS scoring rules were too complex for interviewers to apply while administering the interview. As such, efforts were made to simplify the conversion of frequency and intensity into severity ratings, in order to streamline administration and scoring of the tool.

Furthermore, there have been some changes in instructions for the CAPS during the revision of DSM-4 to DSM-5. One of the biggest changes is that the administrators need to identify an index trauma, rather than allow recording of symptoms associated with up to three traumatic experiences at once (Mueller-Engelmann et al., 2018). The instructions are very clear that symptoms need to be associated with the index trauma (i.e., worst trauma) with disturbance for more than one month. If a clinician chooses to conduct the CAPS for more than one trauma, the entire CAPS administration needs to be repeated for each traumatic event. It is not necessary to complete the CAPS for more than one traumatic event as a diagnosis only needs to be established once. In practice, however, this introduces the potential

to lose clinically relevant information which would otherwise inform formulation and treatment of the individual. A unitary view of PTSD also does not consider the cumulative and complex nature of multiple traumas. Indeed, Priebe et al. (2018) found that focusing on a single worst traumatic incident may skew the interpretation of treatment effects due to overlooking clinically relevant symptoms associated with multiple trauma exposure. In their sample of N = 58 patients exposed to childhood sexual abuse, PTSD symptom severity scores were higher when the index trauma included multiple trauma exposures and treatment was less effective for individuals who were treated for symptoms related to multiple traumas compared to trauma specific treatment. This emphasises the impact of defining an index trauma in individuals with multiple traumas.

To identify the index trauma (or criterion A as per DSM-5 definition) it is recommended that the Life Events Checklist (LEC) be administered prior to the CAPS administration (Weathers et al., 2013b). This feature of the CAPS was carried over from the previous CAPS version, and minimal changes were made to the LEC with the revision of the DSM-5 (Weathers et al., 2013b). Interviewees are provided with 16 types of traumatic events or an open-ended trauma question if their traumatic experience does not fit the checklist. The LEC also assesses how the interviewee was exposed to the trauma (e.g., witnessed the event or directly involved). The LEC is not a PTSD assessment, but a trauma assessment to identify what someone has been exposed to. There are three versions of the LEC, one checklist, two extended versions to see which the worst trauma is if there are multiple traumas, as well as an interview to ask follow-up questions about a traumatic experience. The LEC establishes what trauma occurred and the CAPS can help identify if consequences of the traumatic event meet diagnostic criteria for PTSD (Weathers et al., 2013b).

Similar to the CAPS-4, the CAPS-5 allows for assessment of three different time

periods: symptoms for the past week, past month, or lifetime PTSD. The CAPS-5 has a questionnaire for each of these time frames where as before, the CAPS-4 required recording of symptoms for all the three timeframes simultaneously (Blake et al., 2000). The CAPS-5 includes an assessment of all PTSD symptoms as stipulated in the DSM-5, as well as associated features of the disorder such as dissociation (Table 1). The interview contains 20 items related to PTSD symptoms, which has been increased from the previous version of 17 symptoms as a direct reflection of DSM-5 changes. The measure also accounts for overall ratings of distress, impairment in different areas of functioning, response validity, symptom severity, and improvement in symptoms since a previous assessment (Weathers et al., 2017). Compared to the previous version, some of the language of the items has been changed to match the DSM-5. Weathers et al. (2017) highlighted that the amended scoring format of the CAPS-5 made it easier to learn and administer compared to the CAPS-4. Additionally, the time of administration suggested for the CAPS-5 has not reduced with its revision. One of the practical limitations of the CAPS tool is that administration might take too long to complete (Dolan, 2015; D. MacManus, personal communication, December 17, 2018). The manual suggests 45-60 minutes to administer (Weathers et al., 2013c) though clinicians have recommended to set aside 90 minutes for the assessment in order to complete all elements of it (Dolan, 2015).

CAPS Normative data

The CAPS was initially developed based on US male combat veterans (Weathers et al., 2001). Some researchers have argued that there are cultural differences in PTSD symptom expression between different ethnic groups (Green et al., 2000; Khaylis et al., 2007; MacDonald et al., 2013). Trepasso-Grullon (2012) emphasises that understanding the role of culture will enhance PTSD assessments. However, the CAPS has been translated and used

with several other populations such as motor vehicle accident victims (Blanchard et al., 1996); older veterans (Hyer et al., 1996); survivors of domestic violence (Griffin et al., 2005), women with schizophrenia (Gearon et al., 2004); Bosnian refugees (Charney & Keane, 2007); and victims of urban violence in Brazil (Pupo et al., 2011). The CAPS was found to be a reliable and valid measure of PTSD within each of these populations.

Psychometric properties of the CAPS-5

As the tool was revised in 2013, published psychometric evaluation regarding CAPS-5 for DSM-5 is not yet as extensive as that of previous CAPS versions. The first published psychometric evaluation for the CAPS-5 was conducted by Weathers et al. (2017), with their findings being outlined in this review. One of the goals in updating the CAPS was to maintain compatibility with previous versions of the tool. The reason for this was to ensure continuity of the defining CAPS features, which have been shown to have good content validity and clinical utility, as well as to combine new findings of the CAPS-5 with the existing CAPS literature base (Weathers et al., 2017).

Reliability

For a tool to be reliable, it is important to establish whether it consistently measures an attribute (DeVon et al., 2007), in this case, PTSD. Research often considers *internal reliability*; *inter-rater reliability* as well as *test-retest reliability* of a psychometric tool (Weathers et al., 2001).

Internal Reliability

To measure how well different items on a tool fit together, the Cronbach's alpha coefficient (α) is the most frequently used statistic to assess internal reliability of a psychometric measure (DeVon et al., 2007). Alpha coefficients range from 0.00 to 1.00, with higher values reflecting a greater degree of correlation. Research has suggested that alpha is a function of scale length (i.e., fewer scale items are associated with lower alpha estimates number of items) (Weathers et al., 2017). An alpha coefficient of .70 or greater has been deemed acceptable for new scales (DeVellis, 2003) or research tools, and a coefficient of .90 or greater has been recommended for clinical tools (DeVon et al., 2007) in order to claim internal reliability of a measure. Additionally, research has emphasised that alpha values are inflated when computed for an entire scale, and as such the alpha value should be computed for individual subscales (DeVon et al., 2007).

Weathers et al. (2017) examined Cronbach's alpha of the CAPS-5 using two US veteran samples (n = 165 and 207). The researchers found the internal consistency for the full scale (i.e., overall severity score) to be high (α = .88), suggesting that it almost reaches the recommended level for clinical usage if the aforementioned values are considered as a reference point (DeVon et al., 2007). However, the alpha coefficients for the independent symptom clusters (as outlined in Table 1) varied: re-experiencing symptoms (α = .77); avoidance symptoms (α = .55); negative alterations in cognitions and mood symptoms (α = .77); and arousal and reactivity symptoms (α = .65). The authors postulate that the low score for avoidance symptoms may be as a result of the scale only listing two items (Table 1), and suggest that their analysis of CAPS-5 scores "demonstrated strong internal consistency" (p. 14). This contradicts research recommending an alpha value of at least 0.70 when claiming acceptable internal reliability (DeVellis, 2003).

More recently, Mueller-Engelmann et al. (2018) validated a German version of the CAPS-5 using a German sample of female victims of childhood physical and/or sexual abuse as well as a German sample of male and female adults who had been exposed to other types of trauma (e.g., accidents) (n = 223) compared to n = 51 without PTSD. They found high internal consistency of total severity scores with α = .93. Similar to the study by Weathers et al. (2017), the coefficients for the individual symptom clusters varied: avoidance symptoms (α = .65); alterations in cognition and mood (α = .85); alterations in arousal and mood (α = .70); and re-experiencing symptoms (α = .82).

Boeschoten et al. (2018) developed a Dutch version of the tool using a sample of 669 Dutch participants who were receiving clinical assessment or treatment at a centre in the Netherlands following trauma exposure in the workplace (e.g., police officers, firefighters and military veterans). The authors found high internal consistency of total PTSD severity scores (α = .90) and "acceptable" co-efficients for the individual symptom clusters: re-experiencing symptoms (α = .74); avoidance symptoms (α = .63); alterations in cognitions and mood (α = .79); and alterations in arousal and mood (α = .72).

Overall, the studies looking at a German and a Dutch CAPS-5 tool found higher internal reliability in total severity scores compared to the study by Weathers et al. (2017) on the English CAPS-5 tool. All three validation studies reported low internal consistency for the avoidance symptom cluster in their samples (Boeschoten et al., 2018; Mueller-Engelmann, 2018; Weathers et al., 2017). Weathers et al. (2017) attribute the low alpha value for the avoidance symptom cluster to there only being two items for this scale. Thus, further defining the avoidance symptom cluster and adding items to this scale could increase alpha scores (Tavakol & Dennick, 2011).

Test-retest Reliability

Test-retest reliability is measured by administering a psychometric to the same individual, allowing for a time interval between re-administration. The correlation between the scores obtained during administration indicates the stability of the tool over time (DeVon et al., 2007). Research has stated that time intervals between initial testing and re-testing are controversial, though the idea is that the time interval is long enough for the respondent not to remember their original answers (DeVon et al., 2007). Test-retest reliability can be measured by Interclass Correlation Coefficients (ICC; DeVon et al., 2007) with a high correlation indicated by ICCs exceeding 0.75 (Mueller-Engelmann et al., 2018), or kappa coefficients (κ) over .75 (Fleiss, 1981).

Weathers et al. (2017) re-administered the CAPS-5 within 1 to 6 days of initial administration and reported high test-retest reliability with a κ value of 0.83 for PTSD diagnosis. Weathers et al. (2001) suggest that an interval of a few days to a week is reasonable for the assessment of PTSD. Additionally, Weathers et al., (2017) calculated ICC scores for total symptom severity (ICC .78), re-experiencing symptoms (ICC .80), avoidance symptoms (ICC .67), negative alterations in cognition and mood (ICC .72), and alterations in arousal and reactivity (ICC .64). The authors suggest that the level of agreement in total severity scores obtained during first and second administration was “good”, and that the level of agreement for the individual clusters was “adequate-to-good”. However, the authors did not specify minimal correlations, making it difficult to evaluate these findings (DeVon et al, 2007). If the ICC cut-off scores suggested by Mueller-Engelmann et al. (2018) are taken as a reference point, the test-retest reliability of the CAPS-5 can be considered high for Weathers et al.’s (2017) sample of US veterans, with the exception of the avoidance symptom cluster and the alterations in arousal and reactivity symptom cluster.

Inter-rater Reliability

Inter-rater reliability is achieved when various raters or judges achieve agreement in their independent scoring of an assessment or psychometric tool (Seilkind, 2010). It is typically measured using kappa coefficients (κ) or ICC as previously mentioned for test-retest reliability. The two main authors of the study by Weathers et al. (2017) conducted independent ratings of 28 audio-recorded CAPS-5 interviews. The agreement between the authors who rated the interviews was deemed good. Specifically, for PTSD diagnosis, κ was .78, and the total severity score was high (ICC .91). The authors conclude that this indicated "little measurement error due to […] raters" (p. 14).

The longitudinal study by Marmar et al. (2015) also reported inter-rater reliability for CAPS-5 interviews conducted with a sample of Vietnam veterans. An independent rater separate to the study team was asked to rescore 60 of 400 randomly selected, audio recorded interviews. Determining kappa coefficients, the authors found high inter-rater reliability (κ .93). In addition, the study by Muller-Engelmann et al. (2018) reported high inter-rater reliability when seven raters rated two out of 12 randomly selected videotaped German CAPS-5 interviews (ICC = 0.81).

In the Dutch validation study, 29 audio recorded CAPS-5 interviews were re-assessed by blind assessors who were randomly assigned an audio recording. The authors reported high inter-rater reliability of PTSD severity score (ICC = 0.98) (Boeschoten et al., 2018). The inter-rater reliability for PTSD diagnosis was lower in this study compared to the validation study of the English CAPS-5 tool by Weathers et al. (2017). The authors suggested that this was due to greater flexibility for clinical judgment between raters, which has been more stringent in previous CAPS versions.

Validity

Validity has been defined as a psychometric tool's ability to measure the attributes of the construct under study (DeVon et al., 2007). Specifically, DeVon et al. (2007) identified that a number of different types of validity should be considered when establishing the validity of a psychometric measure: *content validity*, *construct validity*, *convergent validity* and *concurrent validity.*

Content Validity

DeVon et al. (2007) suggest that a tool has content validity if it measures all aspects of the construct (e.g., PTSD). They highlight that typically a tool is developed based on various sources of information that help define the construct such as expert opinion, population observations, qualitative research or empirical literature. Indeed, the revision process for the CAPS-5 was based on consideration of relevant empirical literature, critiques and user observations of the CAPS for DSM–IV since it was revised 20 years ago, and discussions between CAPS authors and their colleagues (Weathers et al., 2017). Weathers et al. (2001) argue that there is clear consensus among those familiar with the tool that the CAPS corresponds with the construct of PTSD.

Construct Validity

A psychometric measure has construct validity if the items contained in the tool exclusively measure a construct, for example, distinguishing PTSD symptoms from closely related concepts such as depression (DeVon et al., 2007). Weathers al. (2017) administered a range of psychometric questionnaires looking at depression, anxiety, physiological symptoms, functional impairment, alcohol abuse and psychopathy. The authors examined correlation

between CAPS-5 total severity scores and those of the other measures. They reported moderate correlations with depression, anxiety, physiological symptoms, and functional impairment (r's = 0.33 to 0.54), as well as weak and non-significant correlations to alcohol use (r = 0.02) and psychopathy (r = 0.18), whilst the strongest correlation was found to other measures of PTSD such as the PCL-5 (r = 0.66) and the CAPS-4 (total severity score r = 0.83). These findings suggest good construct validity of the CAPS-5 for Weathers et al.'s (2017) sample of US veterans.

Research has indicated that the CAPS allows for clarification of symptoms due to prompts accounted for in the interview. Palmieri et al. (2007) suggest that this increases the validity of the tool compared to self-reported measures, particularly with individuals who do not have insight into their behaviours or tend to minimise the impact of their symptoms.

Convergent Validity

Convergent validity occurs where measures that are expected to correlate do so (Michel et al., 2016). When comparing scoring of the CAPS-4 to the CAPS-5, Weathers et al. (2017) found that 76.7% of PTSD diagnosis corresponded between the two assessments (κ .51); 16.7% (5 individuals) met PTSD diagnosis on the CAPS-5 but not the CAPS-4, and 6.7% (2 individuals) met CAPS-4 diagnosis but not CAPS-5 diagnosis. After establishing a minimum requirement score for diagnosis using the CAPS-5 (26/80 total severity score) and CAPS-4 (50/136 total severity score), the two assessments strongly correlated (κ .84). Therefore, introducing a cut-off score, calibrated the total severity scores of the tools, corresponding in 93.3% of PTSD diagnosis in their sample. The authors concluded that despite changes to the DSM-5 and the CAPS-5, individuals are diagnosed the same and

discrepancies between diagnosis was due to measurement errors (e.g., timing, interviewer) rather than the psychometric rigor of the CAPS-5.

Concurrent Validity

Concurrent validity determines if the CAPS-5 produces the same PTSD scores as other tests, which have previously been validated for the assessment of PTSD (Seilkind, 2010). Research has examined CAPS-5 scores compared to various questionnaire measures for PTSD using Pearson correlations coefficient (r) (Weathers et al., 2017). Weathers et al. (2017) found that CAPS-5 total severity scores most strongly correlated with the PTSD Checklist for DSM–5 (*PCL-5*; Weathers et al., 2013a) (r = .66) and the PTSD Checklist–Civilian version (*PCL-C*, Weathers et al., 1993) (r = .66) in their two US veteran samples (*n* = 165 and 207). Marmar et al. (2015) found higher correspondence between the CAPS- 5 and the PCL-5 (r = .80), as well as for the PCL for DSM-IV (r = .79), and the M-PTSD (r .74) in their sample of 400 US veterans. These findings were mirrored by Pupo et al. (2011) who reported r = .91 for the M-PTSD in their sample of 98 Brazilian urban violence victims using CAPS-4 (50 with PTSD and 48 without PTSD). This compares favourably to DSM-IV diagnostic criteria for PTSD because earlier studies looking at the CAPS-4 total scores demonstrated strong correlations with the M-PTSD scale (r = 0.70; 0.73; 0.81; 0.83; 91) and the PCL (r = 0.89 and 0.94) when looking across a number of studies (Weathers et al., 2001). In addition, So et al. (2016) found that, in a clinical sample of Korean veterans, the Posttraumatic Diagnostic Scale (PDS; Foa et al., 1997) performed relatively well compared to the CAPS-5. It was suggested that this is a suitable self-report measure for PTSD as an alternative to the clinician administered CAPS tool. Overall, it appears that the CAPS-5 corresponds highly with other well-established PTSD measurements and variations in

correlation coefficients are likely due to small, non-generalisable samples (Weathers et al., 2017).

Furthermore, Mueller-Engelmann et al. (2017) reported high correlation between the German CAPS-5 and the German PDS (r = .87). Foa et al. (2016) found a moderate correspondence between the PSSI-5 total score and CAPS- 5 scores. Weathers et al. (2017) have queried whether both tools need to be calibrated in a similar fashion as for the CAPS-4 and CAPS-5 scoring, as the PSSI-5 and the CAPS-5 quantify PTSD very differently.

Conclusions

The research previously discussed suggests that the CAPS-5 is a strong psychometric measure for assessing PTSD, with reports of high internal reliability, good test-retest reliability in respect of overall PTSD symptom scores (adequate-to-good for individual symptom clusters), as well as excellent inter-rater reliability. Additionally, it appears that the CAPS-5 is a valid tool when compared to the CAPS-4 and other questionnaire measures. However, these findings are based on one validation of the original tool, and one validation study for a German and Dutch translation of it. Further research is needed to demonstrate that the CAPS-5 is as psychometrically robust as its predecessor, CAPS-4, when assessing PTSD across a range of cultures and trauma backgrounds. As it stands, it is unclear as to whether the discussed findings are generalisable to other populations (Weathers et al., 2017). Interestingly, the German version of the interview reported even higher internal consistencies compared to the English CAPS-5. Although, the study has its own limitations, this supports the applicability of the tool to a completely different sample (i.e., victims of childhood abuse and car accidents) compared to Weathers et al.'s (2017) study with US veterans. The Dutch

version of the tool also demonstrated some promising psychometric properties albeit that the authors did not establish test-retest reliability or validity of the tool (Boeschoten et al., 2018). Additionally, all validation studies showed issue with the avoidance symptom scale achieving low internal reliability across the different trauma samples.

It is clear that diagnostic criteria for PTSD are evolving and, with that, clinicians' understanding of the disorder, thus prompting the revision of the DSM in 2013. Whilst the CAPS-5 is a suitable tool to be used for the assessment of PTSD, it seems that the clinical utility of the diagnostic criteria as stipulated in the DSM-5 is yet to be explored with different trauma populations. As previously mentioned, adjusting the definition of trauma, for example, has resulted in fewer people meeting diagnostic threshold, which will have implications related to access and compensation for treatment. Furthermore, Weathers et al. (2017) and Boeschoten et al. (2018) concluded that dissociative amnesia (Table 1, item 8) and reckless and destructive behaviour (Table 1, item 16) were rare PTSD symptoms in their samples. However, it appears that these symptoms may be specific to certain trauma populations (North et al., 2016) and indeed, Mueller-Engelmann (2018) found that these two symptoms had high clinical relevance in their sample of predominantly female childhood abuse victims. This suggests that despite the widespread usage of the CAPS-5, further validation studies are needed to extend our understanding of PTSD.

Many report the CAPS tool to have become the 'gold standard' when compared to self-report measures and screening tools for PTSD. On the one hand, the CAPS-5 allows for the identification of symptom presence and then allows for prompts to identify behaviours of that symptom. This is practically useful as it allows the clinician to identify discrepancies between self-reported PTSD symptoms and presentation during interview. For example, someone might minimise or deny their symptoms which would otherwise not be picked up by

a dichotomous tool. Conversely, due to the interview nature of the tool, there remains a degree of subjectivity and there may therefore be some ambiguity in deciding on a PTSD diagnosis (not to be confused with high inter-rater reliability for individual symptom severity). Indeed, Boeschoten et al. (2018) recommend clinical consultation of PTSD assessments to ensure reliable diagnosis, particularly when an individual presents with mild to moderate symptoms. The dynamic nature of the assessment promotes rapport building with the assessor, which can help reduce stigma around accepting or seeking treatment, a known barrier for veterans with mental health difficulties (Melotte et al., 2017; Mittal et al., 2013). The interview nature of the tool can help identify treatment goals; this in turn can enhance treatment effectiveness, which should be the ultimate goal when subjecting someone to an extensive PTSD assessment.

CHAPTER THREE:

THE PREVALENCE OF POSTTRAUMATIC STRESS DISORDER (PTSD) AND VIOLENCE AGAINST A PERSON: A META-ANALYSIS

Abstract

Aims

This paper sought to systematically review the extent to which PTSD is associated with the perpetration of violence towards persons other than a family member or an intimate partner in adults, and to empirically synthesise this literature.

Method

Studies reporting prevalence rates of violence amongst those with and without PTSD in adult populations were identified from PsychINFO, EMBASE, Ovid MEDLINE (R), Psycharticles Fulltext, PILOTS, and Web of Science. Primary studies that collected self-reported or clinician assessed PTSD rates, violence rates towards a stranger and were published between 2004 and 2019 were included. Preferred method of reporting for Meta-Analyses (PRISMA) guidelines were followed.

Results

The author identified 10 papers meeting inclusion criteria with a combined sample of 4309 participants. A high degree of methodological heterogeneity was identified between studies resulting in the removal of two studies which were found to have a disproportionate influence on the overall effect when conducting subsequent analysis. A significant association between PTSD and violence was identified with a weighted violence prevalence rate of 37% compared to those without PTSD. The prevalence of violence was higher in military PTSD samples (versus civilian), retrospective studies (versus cross-sectional studies), and violence measured over the past year (versus past month violence).

Conclusion

Although methodological variation between the studies did not significantly impact the overall meta-analytic effect, sub-group analysis was conducted with only a small number of studies. Caution is advised in generalising the results; much lower rates of violence in veteran PTSD samples as well as that in the general population have been reported in individual studies compared to the pooled effect found in this meta-analysis.

Introduction

Posttraumatic stress disorder (PTSD) is a psychiatric condition which develops in consequence of exposure to a traumatic event (Shalev et al., 2017). PTSD can result from direct exposure to traumatic events or vicariously through, for example, witnessing of violence (APA, 2013). The core symptoms of PTSD such as flashbacks or nightmares, avoidance of thoughts, people or places that remind the individual of the trauma, isolation from others, as well as irritability, self-destructive behaviour, hypervigilance, and disturbed sleep can vary in severity (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, APA, 2013; Shalev et al., 2017).

Homicide rates have been the most accurate and consistently reported violent crime type (Lurigio & Staton, 2019), and according to the World Health Organisation (2018), the estimated rate of homicide per 100.000 people in the UK was 1.3 in 2016 compared to 6.5 in the US. UK police recorded crimes suggest a 5% decrease in the total number of homicides from July 2018 – June 2019 compared to the previous year (719 vs. 681) (Office for National Statistics, 2019). The Office for National Statistics (2019) collect UK data that covers crime not reported to the police, referred to as the Crime Survey for England and Wales (CSEW). The CSEW reported a violence prevalence rate of 2.8% per 1000 adults in the UK general population between July 2018 and June 2019. This rate reportedly reduced by 7% between July 2017 and June 2018. Furthermore, Lurigio and Staton (2019) suggest that the overall crime prevalence rate in the US has also been decreasing over time as it was 0.38% in 2017 compared to 1.29% in 2016 per 100.000 US inhabitants. Nonetheless, Lurigio and Staton (2019) note that crime trends will differ within ethnicity, gender and larger cities compared to suburbs. As most crime statistics both for the UK and the US are based on police records, they may be not a good measure for less severe violence. Overall, violence prevalence rates

vary, which emphasizes that crime cannot be measured by a single source (Office for National Statistics, 2019).

In respect of the link between PTSD and violence, research has suggested that greater PTSD symptom severity is associated with perpetrating violence (Antonioli et al., 2018; Barrett et al., 2014; Kirby et al., 2012; Sullivan & Elbogen, 2014) and that in particular this association appears to be driven by hyperarousal symptoms of PTSD (i.e., difficulty concentrating, being easily startled, difficulty staying or falling asleep, feeling more irritable or having angry outbursts, DSM-5) (Barrett et al., 2014). Taft et al. (2011) found a medium sized correlation between PTSD symptoms and physical intimate partner aggression as well as psychological intimate partner aggression in their meta-analysis of 31 studies. Prevalence of physical intimate partner violence (IPV) was greater amongst military samples when compared with civilian participants as well as community samples relative to clinical populations (Taft et al., 2011).

In light of research suggesting that PTSD is linked to an increase of violence, a synthesis of this literature is warranted to yield a more conclusive estimate of risk of having PTSD versus not in respect of violence perpetration. Therefore, the present study aimed to fill a gap in the literature by empirically synthesising the literature examining PTSD symptoms and violence towards a person, other than an intimate partner or a family member. This review looked at violence against a person (e.g., homicide, assault, rape) rather than nonviolent offenses such as drug possession, forgery or theft as violence related injuries or death arguably have different medical costs and legal implications (Corso et al., 2007). By separating violent from non-violent acts, it is hoped to obtain a more accurate prevalence rate of general violence reported in the existing literature. Accordingly, the first aim of this review is to summarise current literature with regard to prevalence rates of violence in those with

PTSD. The second aim is to explore whether there are differences between population samples (e.g., military vs. civilian), study design (e.g., cross-sectional vs. prospective observation of PTSD), and time frame of observed violence (past month, past year or violent conviction).

Methods

Search Strategy

A review of the literature was carried out for existing meta-analyses and systematic reviews; no reviews regarding the prevalence rate of general aggression (against a person other than an intimate partner or family member) amongst those with PTSD were found. A scoping search was then undertaken to ascertain commonly used terms related to PTSD and violence and to establish the viability of the research question. The scoping exercise aided the development of the final search syntax.

The following online bibliographic databases were searched on 09.10.2019: PsychINFO (1967 – September 2019, week 5), EMBASE (1974 – 08.10.2019), Ovid MEDLINE (R) (1946 - September 2019, week 4), Psycharticles Fulltext, and PILOTS. Web of Science was also searched on 10.10.2019. The use of free text words enabled searching to locate matches in the abstract, title or the main text of existing research articles. This enabled the author to maximise the opportunities to return all relevant papers. Boolean operators were utilised: 'OR' to capture synonyms and 'AND' to combine separate search concepts. For the Web of Science and PILOTS database the Boolean operator 'NOT' was also used, whereas this function was not available on the remaining databases. The search terms outlined in Table 2 were utilised for each of the databases.

Table 2

Search Syntax

Construct	Free Text Search Terms	Method of Search	Limits
Posttraumatic Stress Disorder	"Posttraumatic Stress Disorder" [OR] "Shell Shock" [OR] "PTSD" [OR] "posttraumatic stress disorder" [OR] "stress disorder"	Free search terms All search terms combined with *AND*	Peer reviewed articles 1987- October 2019 English Language Adult [18+] NOT Victim* Survivor* Youth* Teenager* Adolescen*
Violence	"general" [OR] "stranger" [OR] "community" [OR] "interpersonal" [OR] "prison" [OR] "peer" [OR] NEAR/3 Violen* [OR] Beat* [OR] Abus* [OR] Assault* [OR] Aggress* [OR] Batter* [OR] Offend* [OR]		

Perpetration	Perpetrat* [OR] Offender* [OR] Aggressor* [OR]

Inclusion and Exclusion Criteria

The papers yielded from the searches were screened according to predetermined inclusion and exclusion criteria described in Table 3. As outlined in the table, studies that only reported sexual or psychological violence (in the absence of measured physical violence) were to be excluded. This decision followed discussion between the author and her supervisor and was based on research suggesting that the aggressor of sexual violence is, in most cases, known to the victim (WHO, 2012). Indeed, sexual violence statistics for England and Wales suggested that 90% of rape victims know the perpetrator prior to the offence (Ministry of Justice, Home Office & Office for National Statistics, 2013). Furthermore, risk factors have been identified that are of particular relevance to sexual violence such as gender-inequitable views, and the health consequences may be different following sexual violence with, for example, a higher risk for sexually transmitted infections or unintended pregnancies (WHO, 2012). Similarly, psychological violence encompasses coercion, threat and harassment; behaviours which are arguably more difficult to measure due to their cognitive rather than physical impact, and the absence of physical proof has been noted as a barrier for reporting the behaviours, as well as prosecution (SafeLives, n.d.).

Table 3

Full inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria	Justification
Phenomenon of interest:		
Studies that reported PTSD prevalence rates and a comparison of those who did not have PTSD amongst individuals who were violent towards a stranger.	Studies only reporting rates pertaining to any other psychiatric disorders such as depression, anxiety or adjustment disorder. Studies reporting violence rates in absence of PTSD prevalence. Studies reporting violent victimisation.	To ensure that the data extracted from the included studies can be meaningfully compared and event rates calculated.
Studies using self-report measures for PTSD as well as clinician administered assessment tools were included.		Although, the CAPS is considered the gold standard assessment tool for PTSD, this is more frequently used in practice whereas self-report measures are more often used for research purposes.
	Studies were excluded if they looked only at trauma exposure in absence of PTSD assessment.	
Studies reporting a PTSD diagnosis as well as studies reporting PTSD below the diagnostic threshold		
Participant focus:		
Adult populations (18+). Female and male samples.		
Civilian populations, substance abusing populations, prison populations and military/veteran populations. Populations with Traumatic Brain Injuries or any other physical injuries were also included.		
Outcome data		
The studies are required to report frequency counts of individuals with and without PTSD who have engaged in		To ensure that outcomes can be calculated into relative risk ratios.

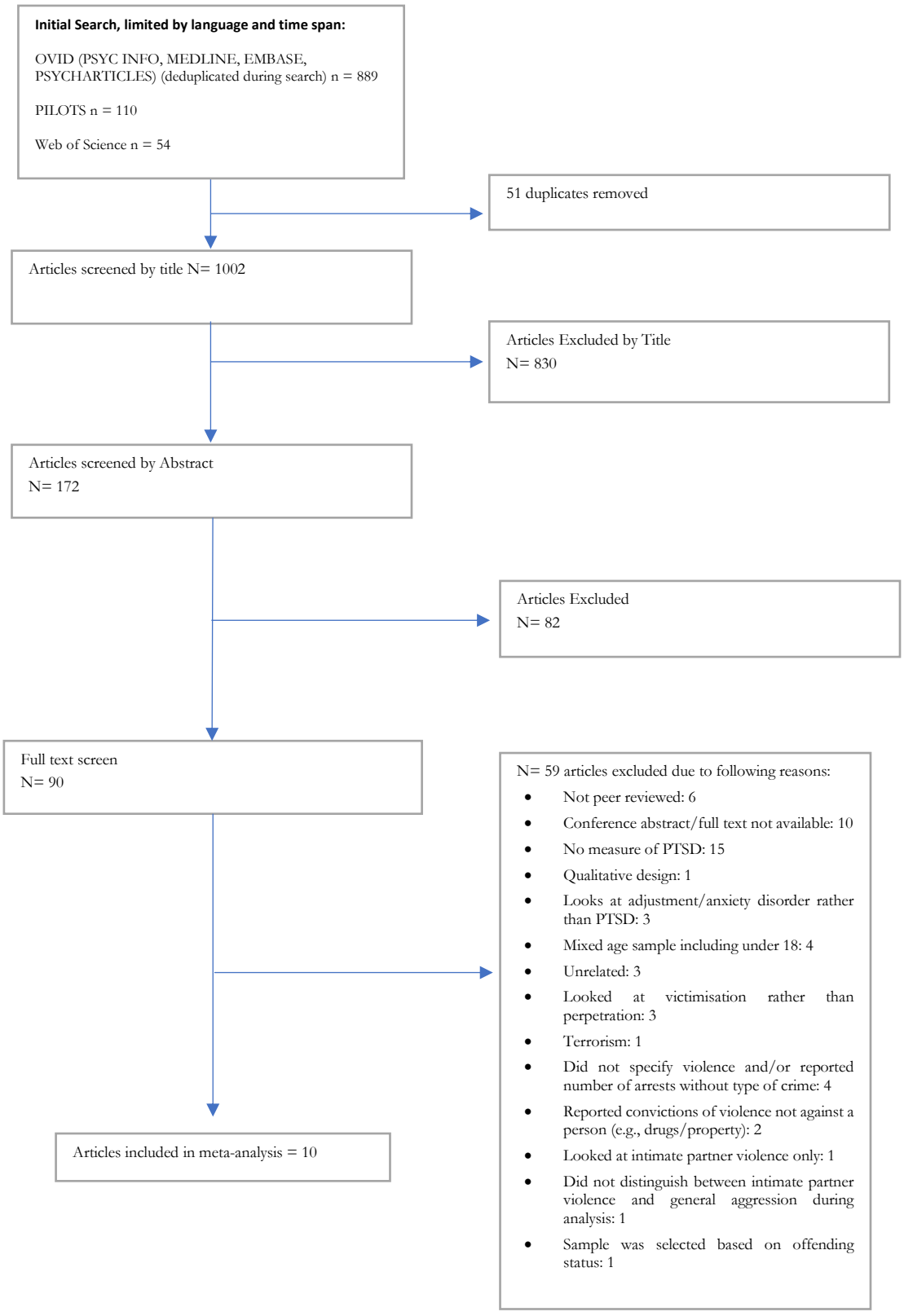
Inclusion criteria	Exclusion criteria	Justification
stranger violence.		
Violence that is directed towards another person (child or adult) or has the potential to cause physical harm or fear of physical harm to another person (child or adult) could be assessed by any measure of violent behaviour.	Studies reporting violence towards an intimate partner or family member only. Studies reporting only violence to self. Studies reporting only psychological or sexual violence.	A meta-analysis looking at PTSD and intimate partner violence already exists (see Taft et al., 2011). It is argued that psychological violence is more likely to occur in an intimate context rather than directed towards strangers.
If both collateral- and self-reported aggression/violence were reported, the collateral data will be used in analyses.		This provides a more objective account of violence perpetration.
Type of article		
Correlation or case cohort reporting prevalence rates for general violence in persons with PTSD	The following article types were excluded: meta-analysis/theoretical papers/ reviews/commentaries/ clinical guidance/non-outcome focused studies i.e., longitudinal/association studies/case studies/validation of psychometric scales/qualitative papers/ single case studies/case series	These articles do not provide the outcome data needed for this meta-analysis.
Outcome Data and Study Design		
Studies where comparable data between those with PTSD and those without who have engaged in violence were reported.	Studies that reported hypothetical data i.e., violence induced in a laboratory setting were excluded. Studies published in any language other than English were excluded.	
Paper published during and after 2004 (last 15 years).		
Research based on ten or less subjects.		To distinguish case studies from group designs. This also increases methodological rigour of studies included.

Selection of Studies

The database searches yielded a total of 1053 citations of which 51 duplicates were removed. The titles and abstracts of the remaining papers were screened using the exclusion criteria and a further 912 papers were excluded. Of the 90 papers remaining, the full text articles were reviewed using the inclusion criteria and a further 59 papers were excluded for various reasons listed in Figure 1. Out of 21 papers only 10 contained sufficient data to be included in the meta-analysis. An overview of these papers can be found in Table 6.

Figure 1

Results of the systematic search and the application of the inclusion criteria



Risk of Bias Assessment

A quality framework was developed such that methodological bias in the included studies could be identified and quantified. The quality criteria were adjusted from pre-existing frameworks, namely The Cochrane Collaboration Risk of Bias Tool (Higgins et al., 2011) and the Risk of Bias Assessment Tool for Non-randomised Studies (Kim et al., 2013; Downs & Black, 1998) in order to specifically meet the needs of this meta-analysis. The framework used in this review included the assessment of each article based on six domains: Selection Bias, Detection Bias, Statistical Bias, Reporting Bias, Performance Bias, and Generalisability (see Table 5). Each domain consisted of a number of items, rated as "low", "unclear" or "high risk" of bias, which is summarised in Table 4.

Table 4

Overview of the quality framework to assess risk of bias

Risk Domain	Details	Risk of Bias Rating
Selection Bias	Does the study design yield a sample of respondent's representative of the target population? Is the target population defined clearly? Was some form of random sampling used to select potential respondents?	High Risk - The study has used opportunistic or non-random sampling to select participants. The characteristics of the study group are not representative of the target population. The thoroughness of the selection method (i.e., outcome) is secondary to the main outcome of the study (e.g., study's main focus is not on PTSD). Excludes participants based on PTSD diagnosis. Other exclusion/inclusion criteria may contaminate estimate of events. Unclear Risk - The characteristics of the study group are not clearly defined. It is not clear how the researchers sampled the study group. Sampling is adequate but is selected from a pre-existing (clinical) sample. Selection method is not ideal (e.g., quasi randomised), although characteristics of the study group are representative of the target population. Not clear whether the selection of participants would contaminate estimate of event.

Risk Domain	Details	Risk of Bias Rating
		Low Risk - The characteristics of the study group are clearly described and without evidence of bias (i.e., not from a preselected PTSD sample). Sampling method used is unbiased (i.e., some form of random sampling taken from representative population).
Performance Bias	Performance bias may occur through participants underreporting or over reporting symptoms due to social desirability, as well as other factors such as shame. Were these adequately controlled for? Performance bias due to knowledge of the allocated interventions by participants and personnel during the study. Or due to knowledge of participants' existing diagnoses by personnel. Differences in the levels/type of motivation between the groups.	High Risk - Failure to report symptoms or inability to report symptoms (e.g., due to shame, social desirability). Under-reporting symptoms (e.g., not available to introspective awareness). Over reporting. Diagnosis may affect participants' legal status/custodial pathway/treatment options. Data is not triangulated, based on self-report only. Unclear Risk - High risk of social desirability and inadequate or unclear attempts to adjust for this. Data is self-report, although attempts are made to blind personnel to outcome assessments and check for inter-rater reliability, or anonymisation has taken place. Low Risk - Anonymity was maintained so as not to affect legal status. Low risk of social desirability or high risk of social desirability but attempts made to control for this (e.g., introduction of validity scales or triangulation of information).

Risk Domain	Details	Risk of Bias Rating
Detection Bias	Was the study instrument that measured the parameter of interest shown to have reliability and validity?	High Risk - Outcome measures used are non-standardised and do not report psychometric properties, or global self-evaluation (e.g., yes/no) of PTSD or violence only used as outcome measure. Measure not fit for purpose. Unclear Risk - Assessment measure is not widely recognised, or peer reviewed and/or the psychometric properties are reported but poor. Low Risk - Standardised measures with good psychometric properties used to assess symptoms of PTSD.
Statistical Bias	Bias resulting from the statistical treatment of the data. Were prevalence rates appropriately reported (e.g., including descriptive statistics such as gender)? Was there missing or incomplete data (e.g., the *n* in one section is different to the *n* in another section of the report)	High Risk - Event rate is unclear, inadequately reported, not provided, or calculated based on additional statistical analyses e.g., logistical regression. Event rates are adjusted for methodological confounds. Unclear Risk - Raw event rate or percentage is provided; however descriptive statistics are not clearly provided (e.g., no breakdown by gender for prevalence rates). Low Risk - Adequate descriptive statistics are provided including raw event rate or percentage.

Risk Domain	Details	Risk of Bias Rating
Reporting Bias	Reporting bias due to selective outcome reporting. Does the study describe the completeness of outcome data for each main outcome (including attrition and exclusions from the analysis)? Does the study provide reasons for attrition or exclusions where reported, and any re-inclusions in analyses for the review?	High Risk - Not reported full outcome measures that are stated in the method section which were used to assess PTSD and violence. Reported only a subsample of results/only significant results. Did not report on entire sample. Data does not appear to be accurately reported (e.g., final values are suspect or data is reported in a manner requiring reconstruction from description). Unclear Risk - Did not report the results of all measures used to assess PTSD or violence. Did not report on different types of violence or specify between perpetration and victimisation. Low Risk - Full sample size reported. Reported results of all measures used within the study to assess PTSD and violence.
Generalisability	Are there sufficient numbers of participants for the study to be statistically meaningful? Does the study describe any differences between the study participants and those persons to whom the review is applicable?	High Risk - Sample size < 30. Studies that preselect participants on trauma status or trauma exposure. Studies that preselect participants with additional mental health difficulties or a forensic population. Unclear Risk - Sample size is < 60 or > 30. Sample size is sufficient but there are some idiosyncratic features. Low Risk - Sample size is > 60

Table 5

Summary of Risk of Bias Domains rating for included studies (Red = high risk of bias, amber = unclear risk of bias, green = low risk of bias).

	Selection Bias	Performance Bias	Detection Bias	Statistical Bias	Reporting Bias	Generalisability	Total quality Index
McCallum, (2018)							21%
Lopez Castro et al. (2019)							50%
Bennett et al. (2017)							7%
Marshall et al., (2010)							71%
Taft et al. (2009a)							43%
Taft et al. (2009b)							36%
Sullivan and Elbogen (2014)							43%
Nandi et al. (2017)							36%
Crocker et al. (2016)							50%
Augsburger et al. (2017)							50%

Selection Bias

Of the 10 studies included in the review, only one study was deemed to have low risk of selection bias, having randomly selected their sample from a large, nationally representative population of veterans, which was then stratified based on gender (Sullivan & Elbogen, 2014). Four studies were deemed to have an unclear risk in respect of their sampling, as for example, Taft et al. (2009b) and Nandi et al. (2017) did not describe their sample selection nor efforts to randomise the sample or blind the researchers. Although the study by Crocker et al. (2016) and Marshall et al. (2010) described appropriate sampling

methods, the sample was selected from a pre-existing clinical sample, namely veterans presenting at a clinic for treatment. Five studies were rated as having high risk of selection bias. McCallum (2018) excluded those with a violent index offence and those who were victims of violence as well as perpetrators of prison violence, which may contaminate the true estimate of violence rates in this prison sample. Lopez-Castro et al. (2019) used a sample of self-selected, help seeking individuals who sought treatment for PTSD and Substance Use Disorder (SUD). In addition, they only selected one group out of three intervention conditions (i.e., a third of the sample) to analyse. The study by Bennett et al. (2017) identified PTSD as secondary to the study's main outcome; having selected the sample on the basis of their substance use record and living within the study's catchment area. The study by Taft et al. (2009a) included a pre-selected clinical sample of veterans who were sampled based on their combat exposure. Finally, the sample by Augsburger et al. (2017) consisted of a group of refugees recruited predominantly through accommodation centres for asylum seekers.

Performance Bias

It is of note, that all ten studies analysed self-reported violence data. Four studies were deemed to have an unclear risk of performance bias as in addition to this, the participants' motivation to partake in the studies by Lopez-Castro et al. (2019), Marshall et al. (2010), and Taft et al., (2009a) might have been influenced by the prospect of receiving treatment and/or financial compensation. Furthermore, rather than triangulating data, Lopez-Castro et al. (2019) excluded two participants who would not disclose their offence history. Although PTSD was based on semi-structured interviews rather than self-report in the study by Augsburger et al. (2017), all participants were awaiting their asylum status decision which may have influenced reported stress levels at the time of assessment. Furthermore, six out of ten studies were rated as being at high risk of performance bias as both PTSD and violence

measures were based on participants' self-reports in absence of controlling for social desirability which may have impacted individual responses (i.e., McCallum et al., 2018; Bennett et al., 2017; Taft et al., 2009b; Sullivan & Elbogen, 2014; Nandi et al., 2017; Crocker et al., 2016).

Detection Bias

Five studies reported using valid and reliable outcome measures. However, four studies received an unclear risk of detection bias as, for example, McCallum et al. (2018) did not describe their violence measure and instructed participants to use their homicide offence as the index trauma for the PTSD assessment. The studies by Lopez-Castro et al. (2019) did not adequately describe their violence measure and Nandi et al., (2017) mention having modified their violence measure to fit their research, however, failed to address how this alters reliability and validity of the measure. Moreover, Crocker et al. (2016) reported the use of valid PTSD and violence measure, though comment on their data being skewed as over 75% of participants denied physical aggression on the self-report measure suggesting that the Retrospective Overt Aggression Scale (ROAS, Sorgi et al., 1991) was perhaps not best suited for their study aims. The study by Bennett et al. (2017) was deemed to have a high detection bias due to a reported error in the screening tool for PTSD which resulted in exclusion of one arousal symptom item, without commenting on how this alters the reliability and validity of the PTSD Checklist for Civilians (PCL-C, Weathers et al., 1993). In addition, they used a validated tool to measure violence.

Statistical Bias

Three studies were assessed as having a low risk of statistical bias as they reported either the raw event rate or percentage event rate for PTSD and violence (i.e., Lopez-Castro et al., 2019; Marshall et al., 2010; Crocker et al., 2016). For the sample of McCallum et al. (2018), the number of people who were violent without PTSD needed to be estimated based on the reported data. Additionally, the authors did not report information for those individuals who did not consent to participation and those that were excluded from analysis. Therefore, this study was deemed as having an unclear risk of bias. Furthermore, Augsburger et al. (2017) estimated the responses for nine participants who missed part of the interviews and was deemed to have an unclear statistical bias. The remaining five studies were deemed to be of high risk of statistical bias as the event rates for PTSD and violence were estimated based on transformation of other effect sizes (e.g. logistic regression statistic) (i.e., Bennett et al., 2017; Taft et al., 2009a/b; Sullivan & Elbogen, 2014; Nandi et al., 2017).

Reporting Bias

Following quality assessment, four studies were deemed to have a low risk of reporting bias. However, another four studies were concluded to have an unclear risk of this bias often due to some data (e.g., excluded participants) not having been sufficiently described (i.e., McCallum, 2018; Crocker et al., 2016), as well as describing different types of violence or offences within their samples (e.g., rape and homicide) which was not reported on separately during analysis (i.e., Lopez-Castro et al., 2019; Bennett et al., 2017). Furthermore, the study by Taft et al. (2009b) was deemed as high risk of reporting bias as the authors reported only a partial correlation between PTSD and aggression, controlling for a range of other mental health conditions such as alcohol abuse/dependence and major depression. The

study by Sullivan and Elbogen (2014) was also considered as high risk as the authors merely reported data for significant results.

Generalisability

Five studies were rated as low risk of generalisability. Although the remaining studies had adequate sample sizes, Nandi et al. (2017) included only participants who were married and had at least one child; Ausgburger et al. (2017) highlighted the severe levels of PTSD within their refugee sample; and Taft et al. (2009a) commented that 63% of their sample (N = 236) were Vietnam veterans. Therefore, these three studies were rated as having an unclear level of generalisability. Two studies were rated as high risk in respect of generalisability: McCallum (2018) measured PTSD as a result of the participants' homicide offences and therefore was unable to measure and report PTSD for those who did not commit homicide in the UK prison sample. Additionally, Bennett et al. (2017) selected their sample based on participants' substance use dependence.

Summary

The included studies presented with mixed levels of bias. Each study, except for that of Marshall et al. (2010), had some degree of high risk of bias. Overall, high risk of bias was most evident in the domain of performance bias, selection bias and statistical bias across the studies. Risk was particularly marked in respect of performance bias across the studies, in large due to the self-reported nature of violence and/or PTSD symptoms. In addition, it appears that the selection of the samples could have contaminated the event rates extracted from the papers. Results of this meta-analysis should therefore be interpreted in light of these methodological shortcomings.

Data Extraction

Once the 10 included papers were quality assessed, relevant information pertaining to methodology and sample were extracted.

It was noted that the individual studies differed in their conceptualisation of violence. For example, as can be seen in Table 6, one of the included studies defined a history of violence by number of arrests (Lopez-Castro et al., 2019) whereas other studies measured this by number of acts of aggression. One study also differentiated between physical and psychological aggression, measuring the number of each behaviour over the last year (Taft et al., 2009a). For the purpose of this review, however, any form of violent or aggressive behaviour was extracted under the category 'violence' and is further defined in Table 6.

Event rates were extracted from the papers in respect of the number of participants with and without PTSD who engaged in violent or sexually aggressive behaviour. The extraction of all data was carried out by the author and reviewed by a second rater. Variation in data extraction was discussed and resolved upon closer examination of the individual studies. If primary studies used regression-based procedures, such as logistic regression, event rates may be calculated from the regression statistics. However, regression analysis frequently adjusts for the association of additional covariates, as was the case for the paper by Taft et al. (2009b). Such adjustments highlight the sample dependent nature of the reported regression coefficients, in this case, the association between PTSD and violence, and may report effects dissimilar to those reported in the other studies.

Only two studies reported prevalence rates for those with and without PTSD who engaged in violence, thus allowing for the calculation of relative risk, whereas three studies merely reported the number of individuals who had PTSD and were violent, allowing for the calculation of event rates only. Event rates or relative risk was extracted from transformation

of other effect sizes for the remaining five papers.

Differences were noted in the sample types used for the included research and three categories of sample type were identified: ‘military’, ‘civilian’, ‘prison’ populations as well as one refugee sample (Table 6). The majority of studies included mostly male samples, that is 85% or more of the sample were male. One study included a sample of 25% females, which was classed as a mixed sample in respect of gender. The samples were heterogenous in respect of the tools used to screen or assess PTSD as well as violence.

In order to extract the relevant data, multiple reporting of outcomes was combined to depict a single quantitative outcome using procedures described by Borenstein et al. (2009). For example, the same outcome measured in multiple subgroups, such as violence and PTSD between males and females in Taft et al.’s (2009b) study, was taken together to calculate the effect for the whole sample. Similarly, the effect for partnered and unpartnered veterans was calculated to give an overall correlation of PTSD and violence for the sample in Taft et al.’s (2009a) sample. Sullivan and Elbogen (2014) reported stranger violence (e.g., use of a weapon) and stranger aggression (e.g., kicking, slapping), which was also combined to calculate the average correlation of violence and PTSD in their sample. As a result, each sample size was included only once in the subsequent analysis.

Table 6

Overview of included research papers

Study	Country	Population	Gender	Type of violence assessed	Duration of PTSD symptoms	PTSD Screening/ Diagnostic Tools
McCallum, (2018)	UK	Prison	Mostly male	Not described	Not described	Detailed Assessment of Posttraumatic Stress (DAPS; Briere, 2001)
Lopez-Castro et al. (2019)	USA	Civilian	Mixed	Self-reported arrest for robbery, assault, rape, homicide or manslaughter (endorsement of at least one arrest deemed as violence offending history)	Current	Clinician-Administered PTSD Scale (CAPS; Blake et al., 1995)
Bennett et al. (2017)	USA	Military	Mostly male	Self-reported number of lifetime violent and non-violent legal charges	Current (past month)	PTSD Checklist for Civilians (PCL-C; Weathers, Litz, Herman, Huska, & Keane, 1994)
Marshall et al. (2010)	USA	Military	Mostly male	Self-reported physical assault in the last three months	Not specified	Clinician Administered PTSD Scale (Blake et al., 1990)
Taft et al. (2009a)	USA	Military	Mostly male	Self-reported physical assault and psychological aggression in the past year	Current	Clinician Administered PTSD Scale (Blake et al., 1990)
Taft et al. (2009b)	USA	Military	Mostly male	Self-reported physical aggression in the last year	Current	Mississippi Scale for Combat-Related Posttraumatic Stress Disorder (Keane et al., 1988)

Study	Country	Population	Gender	Type of violence assessed	Duration of PTSD symptoms	PTSD Screening/ Diagnostic Tools
Sullivan and Elbogen. (2014)	USA	Military	Mostly male	Self-reported physical violence (including rape) in the past year	Current (past week)	Davidson Trauma Scale (Davidson et al., 1997)
Nandi et al. (2017)	Burundi	Military	Mostly male	Self-reported violence in the last month. Type of violence not described	Current (past two weeks)	PTSD Symptom Scale-Interview (PSS-I; Foa et al., 1993).
Crocker et al. (2016)	USA	Military	Mostly male	Self-reported verbal and physical aggression in the past month	Current (Past month)	PCL-S (Weathers et al., 1993)
Augsburger et al. (2017)	Germany	Other (Refugees)	Mostly male	Frequency of self-reported reactive aggression (reactions toward an unpleasant and perceived threat with negatively aroused state) within the past month	Not described	German translation of the PTSD Symptom Severity Scale (PSSI; Ehlers et al., 1996)

Data Analysis Strategy

Handling of Data that Violates the Assumptions of the Random Effects Model

Transformation to Effects. Number of participants with PTSD who engaged in violence and number of individuals without PTSD who engaged in violence (where available) were extracted as event rates and relative risk estimates. Relative risk estimates were log transformed prior to numerical synthesis and then back transformed for presentation in tables and figures.

Missing Data and Zero Frequency Data. Zero counts typically occur in studies with small sample sizes which does not allow for accurate estimation of the true event rate. Arguably, a zero-event rate suggests the lack of opportunity to observe an event rather than a true absence of events. Event rates with a zero count can cause numerical problems in the synthesis of relative risk and event rates. To avoid division by zero errors, a small constant (i.e., 0.5) may be added to the zero-event rate. However, none of the included studies in this review reported event rates equal to zero.

The Omnibus Test. The Omnibus test can be calculated using either the fixed effects or the random effects model. The fixed effects model assumes that the true effect size of, for example PTSD and violence, is identical across all studies, and the only reason the effect size may vary between studies is as a result of error in estimating the effect size (Borenstein et al., 2009). When assigning value to the different studies, the information about the effect size is mainly taken from larger samples and samples from smaller studies can be ignored. If two conditions are met, it is appropriate to use the fixed effects model: Firstly, when all studies included in the numerical synthesis have a uniformly sound methodology; and secondly, when the aim of the analysis is to compute the common effect size for an identified population (i.e., not to generalise to other populations). Notably, these conditions are rarely met in psychological research where effects are likely confounded by a number of uncontrolled factors (e.g., the distribution of methodological weakness across studies, individual differences amongst participants, uncontrolled moderators/mediators, natural variation in the effect that is being measured).

Comparatively, the aim of the random effects model is to estimate the mean of a distribution of possible effects, which may vary due to the distinct characteristics of the

samples under investigation. Since each study provides information about a different effect size, all of the different effect sizes are represented in the summary estimate without allowing that overall estimate to be overly influenced by any one study (in the fixed effects model, smaller studies would be assigned lesser weight than a larger study).

As the studies included within this meta-analysis have been conducted by different researchers, use different population samples, and will demonstrate varying methodological strengths and weaknesses, the random effects model will be applied throughout the analyses.

Normalisation and Variance Stabilisation. The simplest and most commonly used method for calculating the between studies variation (tau) is the 'The DerSimonian and Laird method', by fitting the data in to a random effects model. This method assumes that the random effect is normally distributed in the population, stipulating that the effect sizes reported in the primary studies should represent a normal distribution too. Log transformations of the event rates and relative risks estimates aim to normalise the distribution of effects and stabilise the variance of the estimates prior to numerical synthesis using the DerSimonian and Laird method.

Handling Problematic Variance

If problematic heterogeneity (i.e., large variation) is observed across the included studies a 'leave-one-out analysis' will be conducted to identify primary studies that disproportionately influence the meta-analytic synthesis. Any such study will be reviewed and possibly excluded due to risk of bias.

Defining Problematic Variance. Heterogeneity can result from methodological variation in the studies such as measurement error or uncontrolled individual differences

within the population samples. Higgins I^2 is a commonly used measure of heterogeneity. Greater values of I^2 indicate variation that cannot be attributed to true variation in the distribution of the effect in the population and is likely influenced by methodical variation. As there is considerable methodological variation in the primary studies used for the meta-analytic synthesis, problematic heterogeneity was defined as a Higgins I^2 value greater than 75%.

The Quality Effects Model. In the random effects model the precision of an effect is usually estimated as a function of the sample size. The quality effects model (Doi & Thalib, 2008) extends the random effects model by explicitly including ratings of methodological quality (in addition to the sample size) in the estimation of event rates and relative risk estimates.

In this review, the quality effects model was calculated using the total score from the risk of bias ratings reported in Table 5. The quality effects model can be interpreted as the meta-analytic synthesis that would have been obtained had all of the studies been of the same methodological quality as the best study in the review. Accordingly, the quality effects model provides a measure of the effect when the methodological variation across the studies is taken into account.

Identifying Publication Bias and Small Study Effects. Publication bias and small study effects will be explored using the funnel plot. A funnel plot is a scatterplot of the effects against a measure of study precision. It is used primarily as a visual aid for detecting systematic heterogeneity.

In the absence of publication bias, it is assumed that studies with high precision will be plotted near the average (i.e., the meta-analytic synthesis), and studies with low precision

will be spread evenly on both sides of the average, creating a roughly funnel-shaped distribution where the distance from the average is inversely proportionate to the precision of the study. A symmetric inverted funnel shape arises from a 'well-behaved' data set, in which publication bias is unlikely whereas deviation from this shape can indicate publication bias especially if there is an absence of studies in the region associated with small samples sizes and non-significant effects.

If publication bias is identified, then a trim and fill procedure (Duval & Tweedie, 2000) will be undertaken. The trim and fill procedure builds on the assumption that publication bias would lead to an asymmetrical funnel plot. Trim and fill procedure uses an iterative algorithm to remove the most extreme small studies from the side of the funnel plot associated with positive effects, re-computing the effect size at each iteration until the funnel plot is symmetric about the (corrected) effect size. In theory, this will yield an unbiased estimate of the effect size. While this trimming yields the adjusted effect size, it also reduces the variance of the effects, yielding a too narrow confidence interval. Therefore, the algorithm then adds the original studies back into the analysis and imputes a mirror image for each on the side of the funnel plot associated with negative effects. In addition, the fail-safe N will also be calculated (Rosenthal, 1979). The fail-safe N is an estimation of the number of missing studies that would need to be retrieved for the effect to be no longer significant. If this number is large (relative to the number of primary studies in the meta-analysis) then the omnibus test can be considered robust to the effects of publication bias.

Analysis of sub-groups. To further explore potential sources of problematic heterogeneity, subgroup analyses will be carried out using categorical moderators (which

were identified a priori). The significance of the difference between sub-groups will be evaluated by comparison of their 95% confidence intervals.

Results

Omnibus Test for Average Event Rate of Violence Within PTSD Cases

The study level effects for PTSD and violence are reported in Table 7. Nine studies reporting event rates of violence amongst those with PTSD were included in this analysis, with sample sizes ranging between 80 (Lopez-Castro et al., 2019) and 1632 (Taft et al., 2009b), totalling 3612 participants.

Table 7

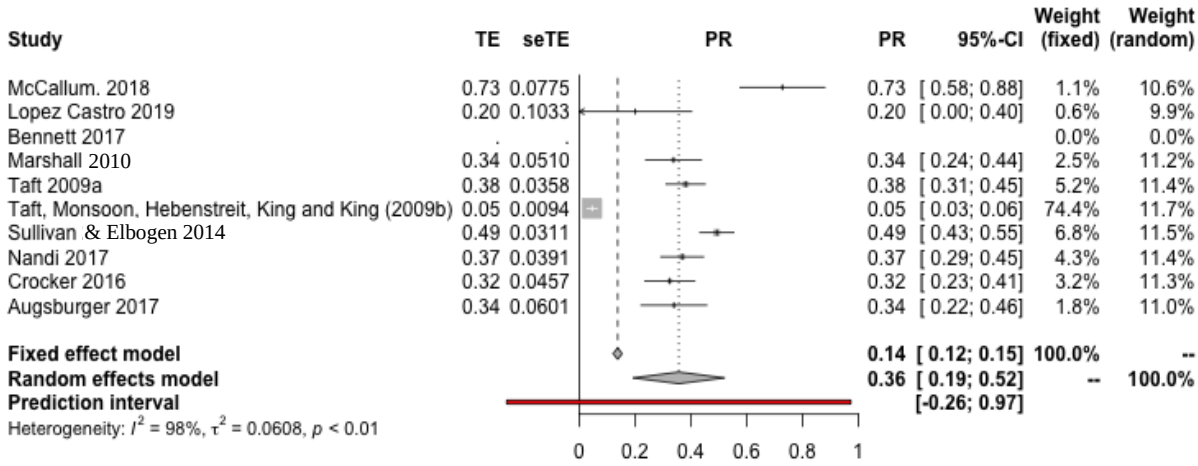
Study level effects for proportion of violence in PTSD

Study	Proportion	Lower 95% CI	Upper 95% CI	Sample size
McCallum, (2018)	0.7273	0.5753	0.8792	110
Lopez-Castro et al., (2019)	0.2000	-0.0024	0.4024	80
Bennet et al. (2017)	Not reported			697
Marshall et al. (2010)	0.3372	0.2373	0.4371	86
Taft et al. (2009a)	0.3804	0.3103	0.4506	236
Taft et al. (2009b)	0.0453	0.0268	0.0638	1632
Sullivan and Elbogen (2014)	0.4922	0.4312	0.5533	866
Nandi et al. (2017)	0.3684	0.2917	0.4451	381
Crocker et al. (2016)	0.3238	0.2343	0.4133	127
Augsburger et al. (2017)	0.3387	0.2209	0.4565	94

Separate estimates from the random effects model were calculated for each study. The individual studies and random effects summary are presented in Figure 2.

Figure 2

Forest plot of event rates of violence in PTSD samples



The random effects model suggested a weighted average effect of 0.3560 (CI: 0.1908 to 0.5211) of violence or aggression prevalence across the included PTSD samples. Measures of heterogeneity suggest significant and substantial differences between the studies reporting this prevalence (tau2 = 0.0608, Higgins I2 = 98%, Q = 407.90, p < 0.0001). For example, McCallum (2018) report a prevalence of 73% whereas Taft et al. (2009a) report a prevalence of only 5%. Accordingly, this substantial heterogeneity may reflect the effect of uncontrolled methodological factors or other biases within the primary studies.

Exploring Heterogeneity

Quality Effects Model

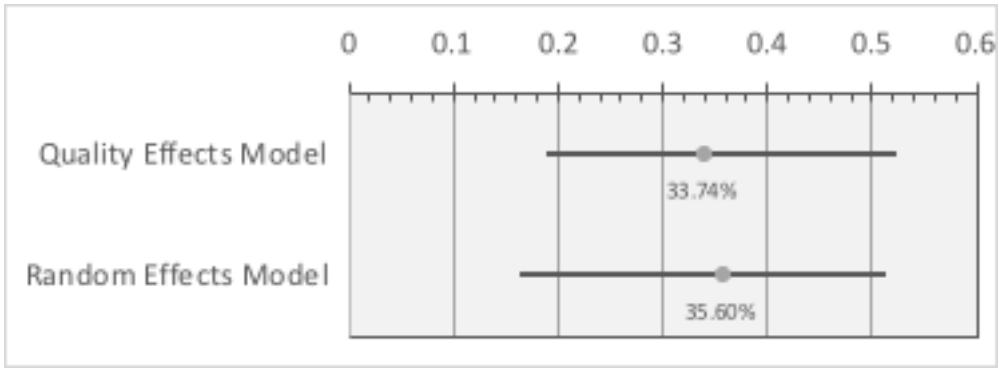
In order to assess the impact of methodological variation upon heterogeneity, a series of subgroup analysis were conducted on the prevalence rates of low, unclear and high risk of bias for each of the six types of methodological bias.

The quality effects model was calculated using the total score from the risk of bias ratings reported in in the methods. The quality effects model can be interpreted as the meta-analytic synthesis that would have been obtained had all of the studies been of the same methodological quality as the best study in the review.

The quality effect model reported a synthesis of 0.34 (95% CI 0.1651; 0.5097). The quality effects model evidences only an approximately 2% decrease relative to the random effects estimate (see Figure 3). Accordingly, when the synthesis includes information about the methodological quality of the studies it is broadly consistent with the random effects model.

Figure 3

Comparison of confidence intervals



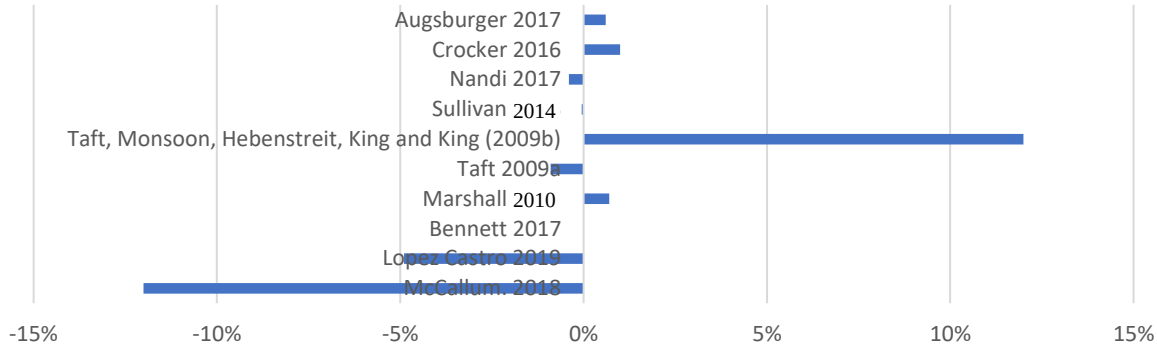
Impact of Influential Studies

The impact of disproportionately influential studies was assessed using a "leave-one-out" analysis, in which the random effects model was calculated with each of the primary studies removed in turn. This measure of influence is depicted in the clustered bar chart shown in Figure 4. If a single study is contributing more than 10% to the overall effect it may be inferred that the study is having a disproportionate or undue influence on the meta-

analysis. As can be seen in the graph, the study from McCallum (2018) impacts the effect of association by -12.37%. This was the only study that used a prison population of offenders. In contrast, the study by Taft et al. (2009b) impacts the meta-analytic effect by 11.88% and as can be seen in Figure 5 is both influential on the overall effect as well as inconsistent with the remaining literature. Upon closer look at this study, data extracted from the paper required several transformations to estimate the raw data required for this meta-analysis. Their data was based on adjusted values, controlling for a range of mental health variables when examining the relationship between PTSD and violence in their sample of Vietnam veterans, producing results very different to the remaining studies included in this review.

Figure 4

Impact of individual studies on overall effect

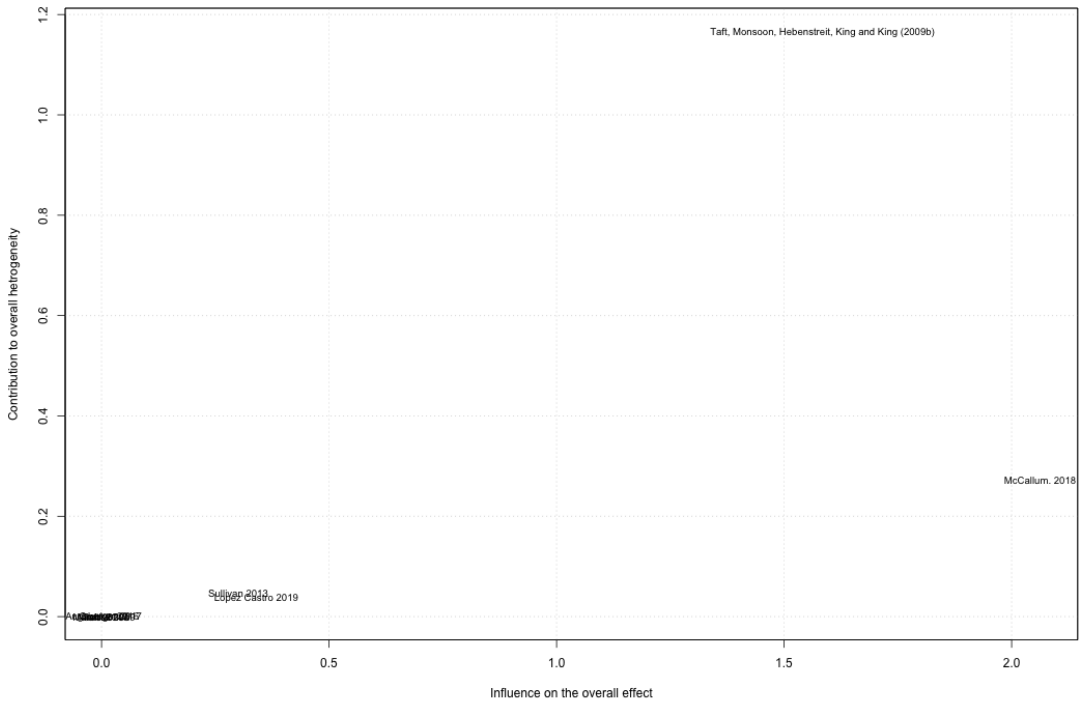


The random effects model was recalculated with the two studies showing disproportionate influence removed. The corrected random effects model reported a weighted average effect of 0.37 (CI: 0.3078 to 0.4280) of violence or aggression prevalence across the included PTSD samples. Removal of the studies by McCallum (2018) and Taft et al. (2009b) reduces the heterogeneity to an acceptable level, suggesting a significant difference between

the remaining studies (tau2 = 0.0041, Higgins I2 = 67.5%, Q = 18.45, p < 0.0052). The corrected random effects model evidences an approximately 1% increase in violence prevalence rate relative to the uncorrected estimate.

Figure 5

Boujat Scatter Plot describing the influence of each study on the overall effect



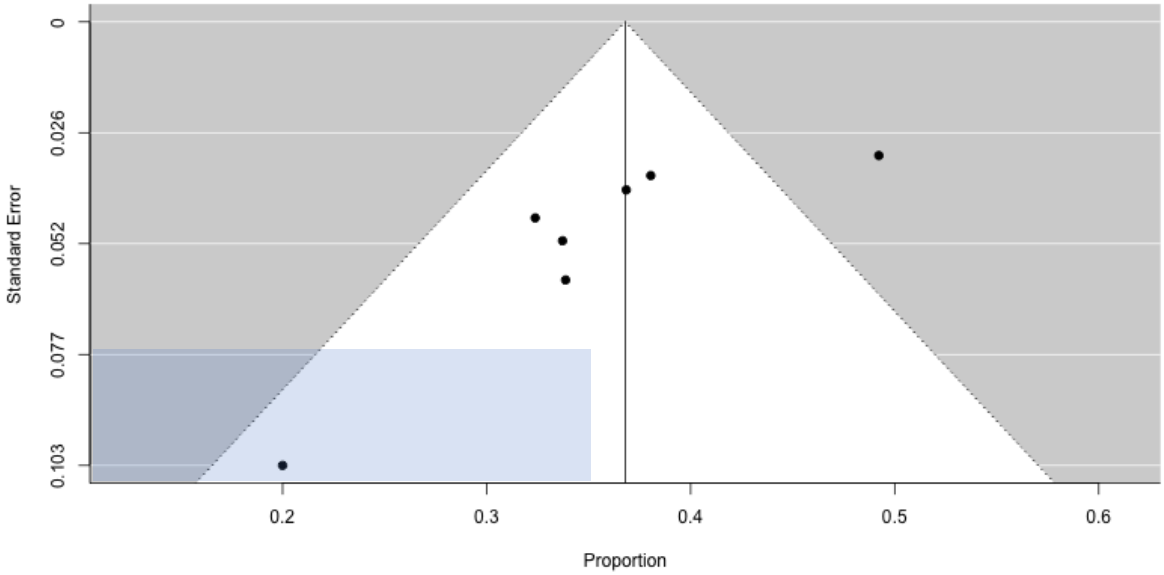
Estimate of Publication Bias

A funnel plot is used primarily as a visual aid for detecting systematic heterogeneity and is presented as a scatterplot of the effects from the primary studies against a measure of study precision (see Figure 6). In the absence of publication bias, it is assumed that studies with high precision will be plotted near the average (i.e., the meta analytic synthesis), and studies with low precision will be spread evenly on both sides of the average, creating a roughly funnel-shaped distribution where the distance from the average is inversely proportionate to the precision of the study. A symmetric inverted funnel shape arises from a

data set which meets the inference assumptions of the meta-analysis. Deviation from this inverted funnel shape can indicate publication bias especially if there is an absence of studies in the region associated with small samples sizes and non-significant effects (marked in blue in Figure 6).

Figure 6

Funnel plot of correlation between PTSD and violence (blue shaded area signifies small studies reporting low prevalence rates)



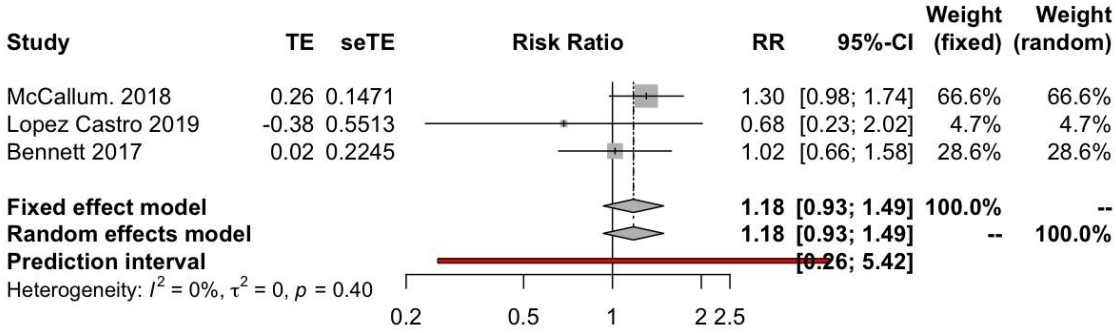
As can be seen in Figure 6, the outcomes reported for the prevalence between PTSD and violence conform to normal expectations and there are no obvious omissions of studies in the region associated with publication bias.

Omnibus Test for Average Relative Risk of Violence Within PTSD Cases

Only three studies reported relative risk, which does not allow for a robust numerical synthesis. The random effects model reported a weighted average of 1.18 (CI: 0.93 to 1.49) of relative risk of violence across the included PTSD samples. For example, Bennett et al (2019) found that substance using veterans with PTSD were at greater risk of a violent legal charge (e.g., rape or homicide) compared to those without PTSD. McCallum (2018) found that UK prisoners with PTSD were at greater risk of engaging in custodial violence compared to those without PTSD. Interestingly, Lopez-Castro et al.'s (2019) study suggests that in their community sample with co-occurring substance dependence, PTSD was not significantly associated with violent offending (e.g., rape or manslaughter), reporting a reduced but not significant risk of violence. However, the data included in this analysis was insufficient evidence to conclude directional magnitude of effect.

Figure 7

Forest plot of relative risk of violence in PTSD samples



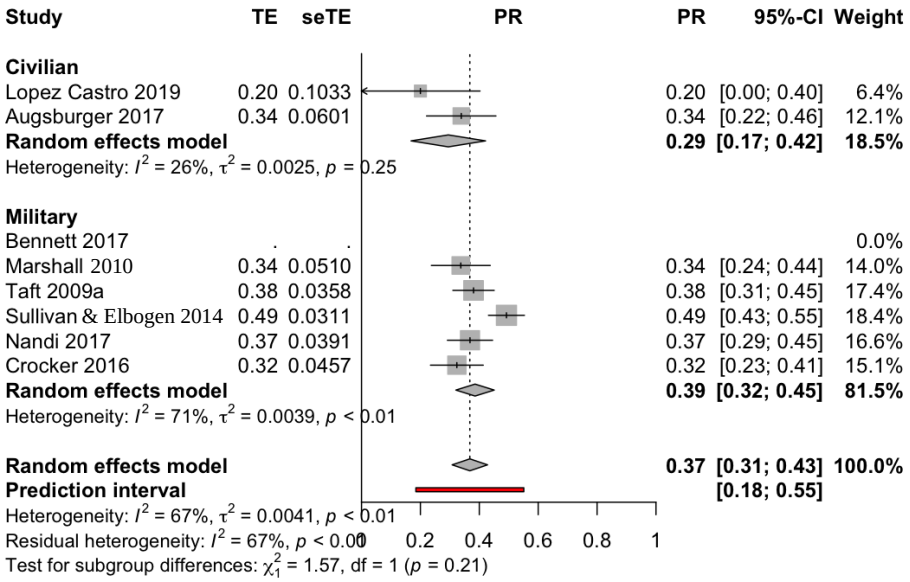
Omnibus Test for Average Event Rate of Violence Within Civilian versus Military PTSD Samples

Six studies selected participants with a military background (Bennett et al., 2017; Crocker et al., 2016; Marshall et al., 2010; Nandi et al., 2017; Sullivan & Elbogen, 2014; Taft et al. 2009a); referred to as the 'Military' group. One study recruited asylum seekers through accommodation centres (Augsburger et al., 2017) and another a sample from an urban, economically disadvantaged community (not further specified) (Lopez-Castro et al., 2019). Consequently, these studies are referred to as the 'Civilian' group.

Separate estimates from the random effects model were calculated for each type of group from which the PTSD samples were recruited. A non-significant difference in prevalence rates between these subgroups was observed ($Q = 1.57$, $p = 0.2108$). The random effects for the two subgroups are presented in Figure 8.

Figure 8

Forest plot of event rates of PTSD and violence by population type



With regards to ‘military’ participants, six studies including a total of 2393 participants, reported prevalence rates for the association between PTSD and violence. The random effects model suggested a weighted average effect of 0.39 (CI: 0.3205 to 0.4507). Measures of heterogeneity suggest significant differences between the primary studies using military samples reporting this prevalence (tau^2 = 0.0039, Higgins I^2 = 71.5%, Q = 14.03, p < 0.01). For example, Sullivan and Elbogen (2014) report a prevalence of only 49% whereas Crocker et al. (2016) report a prevalence of 32%.

Two studies reporting a total of 174 participants, reported outcomes for the association between PTSD and violence, when PTSD was sampled from a ‘civilian’ population. The random effects model suggested a weighted average effect of 0.30 (CI: 0.1683 to 0.4212). Measures of heterogeneity for this subgroup are acceptable and suggest no significant difference between studies using civilian participants (tau^2 = 0.0025, Higgins I^2 = 25.8%, Q =

1.35, $p < 0.25$). Reported prevalence rates range from 20% (Lopez-Castro et al., 2019) to 34% (Augsburger et al., 2017).

Overall, there is almost a 10% difference in prevalence of violence between the civilian and military PTSD subgroup. However, given the small number of studies in the civilian subgroup this effect should be interpreted with caution.

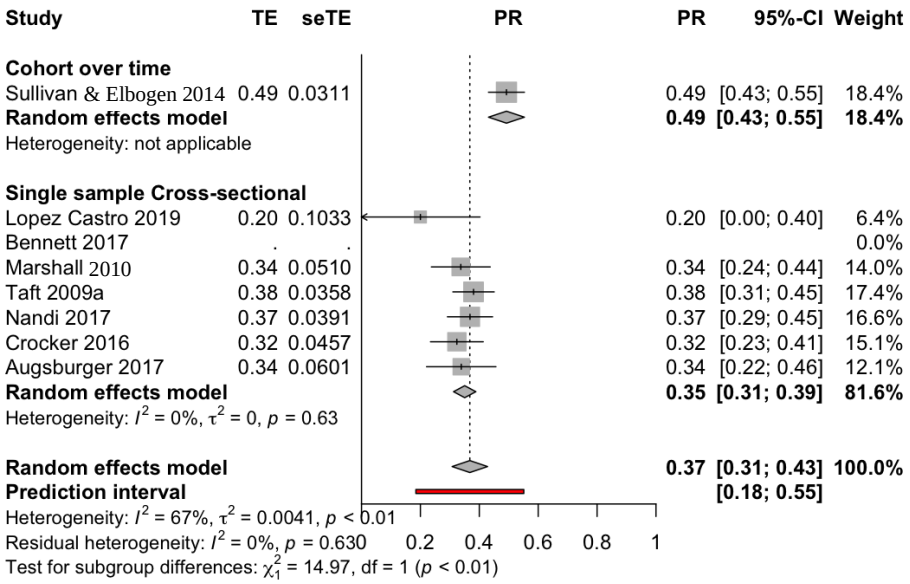
Omnibus Test for Average Event Rate of Violence for Duration of PTSD Observation (Retrospective or Prospective)

Seven studies collected cross-sectional data (i.e., Augsburger et al., 2017; Bennett et al., 2017; Crocker et al., 2016; Marshall et al., 2010; Nandi et al., 2017; Taft et al. 2009a; Lopez-Castro et al., 2019). Only one study used a prospective study design, having measured PTSD at baseline and then one year later violence over the past year (i.e., Sullivan & Elbogen, 2014).

Separate estimates from the random effects model were calculated for each type of study design. A significant difference in prevalence rates between study design was observed ($Q = 14.97$, $p = 0.0001$). However, considering that this analysis included only one prospective study, this effect should be interpreted with caution. The random effects for the two subgroups are presented in Figure 9.

Figure 9

Forest plot of event rates of PTSD and violence by study design



With respect to the cross-sectional study designs, seven studies including a total of 1701 participants, reported prevalence rates for the association between PTSD and violence. The random effects model suggested a weighted average effect of 0.35 (CI: 0.3125 to 0.3884). Measures of heterogeneity suggest no significant differences between the primary studies using a cross-sectional study design (tau^2 = 3.48, Higgins I^2 = 0.0%, Q = 3.48, p = 0.63).

One study (Sullivan & Elbogen, 2014) with a total of 866 participants, reported outcomes for the association between PTSD and violence using a prospective cohort study design. The random effects model suggests a weighted average effect of 0.49 (CI: 0.4312 to 0.5533).

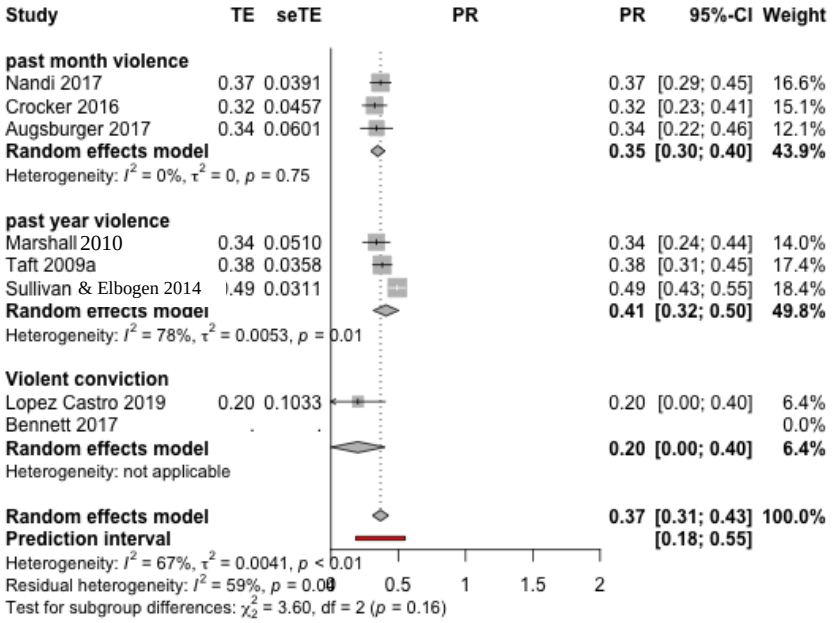
Omnibus Test for Average Event Rate of Violence for Duration of Observation (Past Month, Past Year, Lifetime Violent Conviction)

Three studies assessed violence over a one-month period (Augsburger et al., 2017; Crocker et al., 2016; Nandi et al., 2017) compared to two studies who assessed violence over the past year (Taft et al., 2009a; Sullivan & Elbogen, 2014). Marshall et al., (2010) assessed violence over a three-month period prior to their date of data collection, however, this was included in the 'past year violence' category for the purposes of analysis. The studies by Lopez-Castro et al. (2019) and Bennet et al., (2017) measured violence by way of at least one arrest and charge of a violent offence.

Separate estimates from the random effects model were calculated for each category of violence duration amongst the PTSD samples. A non-significant difference in prevalence rates between these subgroups was observed ($Q = 3.60$, $p = 0.1649$). The random effects for the two subgroups are presented in Figure 10.

Figure 10

Forest plot of event rates for the different time frames of observed violence



Three studies including a total of 602 participants reported prevalence rates for the association between PTSD and past month violence. The random effects model suggested a weighted average effect of 0.35 (CI: 0.2952 to 0.3996). Measures of heterogeneity suggest no significant differences between the primary studies reporting violence over a one-month period (tau^2 = 0, Higgins I^2 = 0.0%, Q = 0.58, p = 0.75).

Three studies with a total of 1188 individuals reported past year violence prevalence rates for those with PTSD. The random effects model suggested a weighted average effect of 0.41 (CI: 0.3154 to 0.5020). Measures of heterogeneity suggest significant differences between the primary studies reporting violence over a one-year period (tau^2 = 0.0053, Higgins I^2 = 78.2%, Q = 9.18, p = 0.001). This difference is notable as Marshall et al. (2010) report a

prevalence of past year violence of 34% in their sample of veterans whereas Sullivan and Elbogen (2014) report a violence prevalence of 49% amongst Iraq and Afghanistan veterans. Marshall et al. (2010) report the lower prevalence rate, having measured violence over a three-month period prior to their date of data collection.

One study (Lopez-Castro et al., 2019) with a total of 80 participants reported outcomes for the association between PTSD and a conviction for violence. The random effects model suggests a weighted average effect of 0.20 (CI: - 0.0024 to 0.4024). As can be seen in Figure 10, Bennett et al. (2017) did not report event rates and therefore Bennett et al. (2017) was not included in this analysis.

Discussion

Summary of Findings

The present review set out to report the prevalence rate of violence against a person other than an intimate partner or family member amongst those with PTSD. A total of ten studies were initially included in the review, reporting outcomes from different population samples. Upon exploration of high heterogeneity between the ten studies, two studies were removed from subsequent analysis due to their disproportionate influence on the overall meta-analytic effect. Overall, results showed a much higher prevalence rate of violence perpetration amongst individuals with PTSD compared to the prevalence rates of violence amongst the general population reported elsewhere (37% versus 0.38% to 2.8%) (Lurigio & Staton, 2019; Office for National Statistics, 2019). In addition, the rate of violence amongst military samples with PTSD was 39% relative to 29% in civilian samples. This rate is also much higher than what has been reported in research looking at veteran samples, with Sullivan and Elbogen (2014) reporting prevalence rates of violence towards a stranger of 9% within their

1-year study period. There was no significant difference between the prevalence rates observed for the different durations of violence (e.g., past month, past year, or violence conviction) amongst the PTSD samples. Interestingly, the prevalence of violence amongst individuals with PTSD was greater when violence was measured over a longer time period. Further confounding variables such as type of violence (verbal, physical, psychological) or measure of PTSD were identified during data extraction, though due to high levels of heterogeneity between the small number of studies included in this review, this did not allow for meaningful numerical analysis.

Attempts to explore variance across the studies due to methodological factors and publication bias were undertaken. The results suggested that there was no publication bias amongst the studies nor did methodological variation significantly impact the pooled prevalence rate of violence.

Clinical Implications

The current review suggests that there is a high prevalence rate of violence amongst individuals suffering from PTSD in those studies that reported sufficient data for numerical synthesis. This confirms claims made by individual research studies that untreated PTSD is a risk factor for aggression and violence in the general population, and even more so amongst military personnel who suffer from combat related trauma. This advocates for swift assessment and treatment following trauma exposure, particularly for veterans returning home from war. The high rate of violence is particularly disconcerting for military populations, who in the year 2014 were found to take on average 12 years to seek help at a UK trauma service (Combat Stress) following military service discharge (Palmer, 2012; Murphy, 2016). Although this is still a long time, it is worth noting that the average time between military

service discharge and individuals seeking help was 24 years in 1994 (Murphy, 2016). This progress further reflects the development and commissioning of veterans mental health services by NHS England in 2016 (NEL Commissioning Support Unit, 2016) such as the establishment of the NHS Veterans' Mental Health Transition, Intervention and Liaison Service (TILS) for Armed Forces personnel approaching service discharge and veterans (NHS England, 2017). Nonetheless, qualitative research has highlighted that veterans have experienced difficulty in accessing mental health services due to avoiding treatment in order to forgo a label of mental illness or stereotype associated with PTSD (Mittal et al., 2013). Some of the participants in Mittal et al.'s (2013) study felt the idea of 'being violent' or 'dangerous' to be the most common public stereotype for veterans with PTSD and therefore, the prevalence rates reported in this review need to be communicated cautiously to avoid exacerbating this stigma.

The stark difference between the pooled prevalence rates in the current review and those reported in individual study samples is alarmingly high and suggest that a third of PTSD populations are at increased risk of violence. However, all studies included in this review reported current PTSD symptoms (i.e., over the last month). It is not clear how lifetime PTSD symptoms, particularly if untreated for a long time would influence violence rates as information regarding time passed between the onset of PTSD symptoms and the first incidence of violence was not reported in the included studies.

It is important to note that whilst this study attempted to quantify the concepts of PTSD and DVA, the experience of PTSD and DVA perpetration are subjective and contextual. Whilst this introduces issues of generalisability, the question remains whether these concepts can or should be generalised to a wider group or whether it would be more appropriate to examine risk factors and needs of individuals who suffer from PTSD and

engage in DVA, perhaps taking a qualitative approach to research going forward. This would also allow for the identification of a range of negative consequences of DVA for the perpetrators and the victims, as well as children who witness violence (Teten Tharp et al., 2014). Such an approach would acknowledge the mental, emotional, and physical burden of PTSD and may help identify and inform treatment and intervention avenues for the veteran as well as their wider family and social network.

Limitations of the Current Review and Avenues for Future Research

This was the first review to pool prevalence rates of violence across PTSD samples. Nonetheless, the current review was limited by the vast heterogeneity between the studies which in turn limited meaningful numerical analysis such as, for example, subgroup analysis based on a very small number of studies in the different groups. As previously mentioned, there was high heterogeneity within the study methodology including sample sizes as well as assessment of PTSD and violence across the primary studies. This limits the generalisability of the findings. Furthermore, PTSD was predominantly based on self-reported symptoms and further research should endeavour to use a clinician-administered PTSD assessment tool to improve diagnostic accuracy of current and/or lifetime PTSD rates. In addition, the cause of reported PTSD differed between the studies. Augsburger et al. (2017) and Lopez-Castro et al. (2019) did not specify the index trauma of their sample, however, one of the samples consisted of refugees awaiting their asylum status, a population with arguably high, acute stress exposure compared to the remaining samples. Four studies assessed veterans with combat or military service-related PTSD (Crocker et al., 2016; Marshall et al., 2010; Taft et al., 2009a; Nandi et al., 2017) and two studies using veterans did not specify their index

trauma for the PTSD assessment (McCallum, 2018; Sullivan & Elbogen, 2014). Finally, Bennett et al., (2017) included military and non-military trauma history in their sample when assessing for PTSD. This does not allow for interpretation of whether different trauma exposure resulting in PTSD account for different levels or types of violence.

Great discrepancy was also noted in classification of violence with studies reporting different severity levels of violence from psychological aggression to physical assault and homicide. Although two studies attempted to distinguish between violent and non-violent offences (e.g., Bennett et al., 2017; Lopez-Castro et al., 2019) both rape and homicide were included in the same category, albeit they have different risk factors (e.g., rape is commonly perpetrated by an intimate partner or acquaintance, National Sexual Violence Resource Centre, 2015). As a result, the high prevalence rates reported in this review should be interpreted with caution and should not be read as PTSD posing an equally high risk to perpetrating high level crimes such as stranger rape or homicide relative to physical assault or psychological aggression. Thus, future research may want to explore rates of PTSD in relation to different types of violent behaviours. Furthermore, all included studies determined violence by self-report, and triangulation of this data may enhance accuracy of violence prevalence rates, too. Nonetheless, some of the described heterogeneity was adjusted for during analysis, for example, by removing two studies during subsequent pooling of prevalence rates, suggesting that regardless of the cause of PTSD, it accounts for an increased propensity to violence.

Community violence among individuals with psychiatric disorders has been related to substance misuse (Buchholz et al., 2017; Chermack et al., 2001; Elbogen & Johnson, 2009; Swanson et al., 2006; Van Dorn et al., 2012). Individuals with comorbid PTSD and substance use have been described as displaying worse symptoms and poorer treatment outcomes

compared to those with a single diagnosis (Najavits, 2002). Out of the primary studies included in this review, Sullivan and Elbogen (2014) collected data on alcohol use, whilst Bennett et al. (2017) and Lopez-Castro et al. (2019) collected data on alcohol and drug use; but it was not possible to control for this confounder when pooling violence prevalence rates. Akin to the meta-analysis by Oram et al. (2014) it was not possible to control for a range of other potential confounders, such as prior violence, other psychiatric conditions (e.g., depression, Buchholz et al., 2017) or duration of untreated PTSD, which may contribute to an increased risk of violence.

Conclusion

This was the first study to quantify the association between general violence and PTSD across a number of studies, which were systematically assessed for methodological quality and specified inclusion and exclusion criteria. The high rate of violence, that is, a third of individuals with PTSD, amongst both the military and civilian samples was unexpected. Further research is needed to validate these rates, which transpire alarming societal and economic consequences if replicated and found to be an accurate risk estimate of general violence amongst those with PTSD.

CHAPTER FOUR:

POSTTRAUMATIC STRESS DISORDER (PTSD) AS A RISK FACTOR FOR DOMESTIC VIOLENCE AND ABUSE (DVA) PERPETRATION IN MILITARY POPULATIONS: A SYSTEMATIC REVIEW OF THE LITERATURE

Abstract

Background

Research has highlighted that domestic violence and abuse (DVA) may be more prevalent amongst military samples compared to non-military offenders. It is thought that Posttraumatic stress disorder (PTSD) is a potential explanatory factor.

Aims

The aim of this research was to review studies which explored the role of PTSD as a risk factor for the perpetration of DVA in active military personnel as well as military veterans.

Methods

A scoping exercise was carried out to determine the relevance of the current review. Available literature was reviewed using a systematic approach. This included database searches, additional hand searches, application of inclusion and exclusion criteria, quality assessment as well as data extraction and synthesis. 27 papers were quality assessed using two different quality assessment tools based on the methodology of the studies. A final 21 quantitative studies were included in this review.

Results

The majority of the studies highlighted that PTSD was associated with physical and psychological aggression as well as injury of the partner. The relationship between PTSD and sexual violence was less clear. Hyper arousal symptoms characterised by: irritability; angry outbursts; reckless or self-destructive behaviour; being easily startled; or problems

concentrating or sleeping, showed the greatest association to intimate partner violence (IPV).

Conclusions

There are issues with generalisability of findings as the majority of the studies were based on clinical samples of help-seeking veterans. Further research is needed with active military personnel and female military personnel. UK based research is lacking, and qualitative research in the area of DVA perpetration amongst military samples is generally sparse in exploring identified risk factors. Assessment of DVA has been restricted by retrospective self-report, which likely limits our understanding of the true breadth and prevalence of DVA amongst military populations who suffer from PTSD.

Background

Much of the research to date has focused on intimate partner violence (IPV) rather than domestic violence as the term domestic violence and abuse (DVA) was only implemented by the UK government in 2013 to "include any incident or pattern of incidents of controlling, coercive, threatening behaviour, violence or abuse between those aged 16 or over who are, or have been, intimate partners or family members regardless of gender or sexuality. The abuse can encompass, but is not limited to psychological, physical, sexual, financial, emotional abuse" (Home Office, 2013, p. 2).

Qualitative research has highlighted that although not every veteran returns home with a debilitating physical or psychological condition, reintegrating into the home and society can still be a difficult transition (Mittal et al., 2013; Freytes et al., 2017; Ray & Vanstone, 2009). Indeed, post deployment reintegration has been reported to be a period of stress experienced by many veterans and their families (Freytes et al., 2017). Military personnel who experienced repeated trauma whilst on deployment are at greater risk of suffering from mental ill health such as developing PTSD (Fear et al., 2010), which may further impact difficulty experienced in reintegration, functioning and quality of life of veterans and their immediate families upon return home (Freytes et al., 2017). For example, Brenner et al. (2015) conducted interviews with veterans who stated that the trauma they experienced during their military service had a debilitating effect on their daily functioning post-deployment, resulting in emotional numbness, difficulty sleeping, and guilt associated with having survived whilst their colleagues had fallen during service. Veterans have also reported that having PTSD has affected their parenting abilities. For example, veterans have stated that they avoid potentially distressing triggers and social anxiety by not attending their children's school activities or sporting events, and that they struggle with feeling an emotional attachment to their children

(Sherman et al., 2016). Several veterans also described incidents of aggressive urges or threats toward their children, which they attributed to their military training, or symptoms of their PTSD such as irritability and being easily startled (Sherman et al., 2016).

As of July 2019, the total number of military personnel employed by the Ministry of Defence was 191, 600 (76.8 % regular[2], 19.1 % volunteer reserves[3], 4.1% other personnel). The Army is the largest branch of UK armed forces with 115,750 regular personnel, followed by the Naval Service and the Royal Air Force (RAF) (Ministry of Defence (MoD), 2019b). The annual population survey in 2017 reported 2.4 million UK armed forces veterans residing in households across the UK. This statistic does not include those that are incarcerated, living in care homes or homeless, therefore the current number of UK veterans is likely higher (MoD, 2019a).

Most service leavers successfully transition into civilian life following their military service (Ashcroft, 2014) and a longitudinal study using a UK sample found that 87.5% of ex-service members were in full time employment (Iversen et al., 2005). The working age veteran population did not view their health to be different from that of the general population, and statistics showed that there was no difference between veterans and non-veterans who reside in the UK, in terms of long-term health conditions including mental illness (MoD, 2016; 2019b). However, some individuals who leave the military service struggle to adapt to civilian life (Sayer et al., 2015). Military personnel may return from service with physical injuries or emotional and psychological difficulties (Coll et al., 2011). Hoge et al. (2006), found that 19.1% of US military personnel returning from Iraq and 11.3% returning from Afghanistan reported psychological difficulties such as suicidal ideation,

[2] This does not include Full Time Reserve Service, Nepalese Gurkha Soldiers, and Military Provost Guard Service.
[3] Volunteer reserves "accept an annual training commitment […] and can be utilised on a part-time or full-time basis to provide support to the Regular Forces at home and overseas" (MoD, 2019b).

depressive symptoms or interpersonal aggression. War-related mental health problems were much higher amongst those who were deployed in a combat role compared to those who were not, and symptoms persisted over 10 years (Hoge et al., 2006). Depression and alcohol use have been evidenced as the most common disorders in American military samples (Riddle et al., 2007; Toomey et al., 2007) as well as UK cohorts (Ismail et al., 2002; Iversen et al. 2009; KCMHR, 2018; Lyne & Packham, 2014), which reflects the general population. However, the majority of research conducted on veterans has focused on PTSD, which is higher in this population, specifically, 6% in UK Armed Forces compared to 4.4% in the general population in 2014 to 2016 (KMCHR, 2018; Iversen & Greenberg, 2009).

PTSD Amongst Veterans

Fear et al. (2010) found that risk of PTSD was higher for those UK military personnel who had a combat role during deployment in a range of theatres, and particularly for deployed reservists compared to un-deployed reservists and individuals who had a support role. These findings were corroborated by the longitudinal cohort study by KMCHR (2018) and mirrored prior research by Pflanz and Sonnek (2002) with combat involvement, high casualties and unexpected deployment highly correlating with psychological distress in US veterans. This was further evidenced in the annual UK military personnel report with rates of PTSD and adjustment disorder being higher for those who had previously been deployed to Iraq and Afghanistan, compared to those who were not deployed (MoD, 2015). A relationship between combat exposure and PTSD has been reported for US Vietnam War veterans (Roy-Byrne et al., 2004), as well as US Iraq/Afghanistan veterans who were returning for further deployment (Polusny et al., 2009).

PTSD may develop after directly experiencing actual or threatened death, serious

injury, or learning that trauma has occurred to a close friend or family member (DSM-5, APA, 2013). PTSD is defined by four symptom clusters: re-experiencing of the traumatic event; avoidance of trauma related stimuli after the event; negative thoughts or feelings; and arousal and reactivity. PTSD sufferers may experience negative emotions such as a distorted sense of self-blame or social isolation and may exhibit aggressive behaviour and experience sleep disturbances, or hyper vigilance (APA, 2013; Levin et al., 2014). Fear et al. (2010) found that military personnel who experienced multiple traumas whilst they were deployed are at higher risk of developing mental health problems such as PTSD. Furthermore, veterans with PTSD have been found to present with higher substance use problems, low income and a higher chance of incarceration (Brewin et al., 2011; Iversen & Greenberg, 2009; MacManus et al., 2013). Importantly, alcohol use and mental health problems have been found to increase the risk for violence post deployment (MacManus et al., 2012, 2013). In summary, most veterans will adapt to the civilian lifestyle and will manage to integrate themselves into employment and society (Ashcroft, 2014). However, there remains a minority of individuals who will leave their service with elevated risk for mental health problems, which may lead to chronic illness and/or vulnerability to substance use and violence.

Domestic Violence and Abuse (DVA) Amongst Veterans with PTSD

A meta-analysis by MacManus and colleagues (2015) yielded that an estimated 10% of veterans commit physical assault and 29% commit physical aggression over a one-month study period. Freeman and Roca (2001) and Elbogen et al. (2010) stated that reports of general violence were greater amongst veterans of the Vietnam War and Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) with PTSD compared to those without PTSD.

In addition to increased risk of general violence, PTSD has been found to be associated with increased risk of DVA. Sullivan and Elbogen (2014) looked at PTSD symptoms and types of violence, finding that the prevalence of domestic violence and abuse perpetrated by veterans (13%) was higher than the prevalence of violence towards a stranger (9%) over a 1-year study period. A US sample of veterans showed that experiencing PTSD as a result of combat exposure was related to an increased risk of male perpetrated IPV in their sample of 376 veteran couples (Orcutt et al., 2003). McCarroll et al. (2000) and Marshall et al. (2005) suggested that domestic violence may be more prevalent amongst veterans compared to civilian individuals, with increased rates of DVA for male veterans that have been diagnosed with PTSD compared to those without PTSD. Although, this view is not universally supported as a robust comparison relating to the prevalence of domestic violence and abuse between civilian and military populations has not yet been conducted, it is of note that veterans present the largest occupational cohort within UK prison and probation services (Short et al., 2018). Finally, Tasso et al. (2016) highlight that although IPV is highly prevalent in the US (with over seven million partner assaults reported per annum), there is a paucity of research investigating violence within military families.

Aims and Objectives

The aim of this study is to systematically review extant studies which explore the impact of PTSD as a risk factor for the perpetration of DVA in active military personnel and military veterans.

The objective is to consider whether active military personnel/ military veterans who suffer from PTSD are more likely to perpetrate DVA compared to those who do not suffer from PTSD.

Methodology

Search Strategy

Scoping Search

A scoping search was carried out to ascertain whether there were any existing reviews regarding the prevalence of DVA in military populations. An electronic search was completed on 04/01/2017 using the Cochrane Database of Systematic Reviews (CDSR) as well as Google Scholar. One study was identified, which looked at prevalence, treatment as well as a range of correlates for intimate partner violence (IPV) in veterans and active service members using systematic review methodology (Marshall et al., 2005). However, this study did not include female-to-male violence, was limited to research published from 1970 – 2005, and used US samples only. Marshall et al. (2005) also included all obtained studies in their review regardless of their methodological rigor. Furthermore, a second systematic review paper was identified that explored the prevalence rates of DVA amongst veterans and serving personnel (Trevillion et al., 2015). However, this study considered all mental disorders including "schizophrenia, schizotypal and delusional disorders, mood (affective) disorders and neurotic, stress-related and somatoform disorders" (Trevillion et al., 2015, p. 1331) calculating prevalence of DVA for the different illnesses. Therefore, this review aimed to explore only PTSD and its prevalence in DVA perpetration by veterans and serving personnel.

When this review was updated on 18/10/2018, a study was found by Misca and Forgey, published in August 2017 which systematically reviewed literature looking at the relationship between veteran and serving personnel and intimate partner violence (IPV). However, this review considered violence perpetrated by both the veteran and the non-veteran partner of the relationship as well as qualitative research studies.

Sources of Literature

This review followed PRISMA reporting guidelines and the protocol is registered with PROSPERO: registration CRD42018080552 (http://www.crd.york.ac.uk/prospero).

Five electronic databases were identified as having been used for previous reviews in the subject area of IPV and were consequently searched for relevant literature:

May 10th, 2017 -- Web of Science Core collection (1900-2017)

May 15th, 2017 – Proquest PILOTS (1871-2017)

Ovid EMBASE (1974 – 2017)

Ovid MEDLINE (R) (1946-2017)

Ovid PsycINFO (1806 – 1966; 1967 - 2017)

These databases were not limited to a specific time frame and the entirety of the databases was searched. To reduce publication bias, unpublished studies (e.g., thesis) were included in the database searches and no language restrictions were imposed on the searches.

To ensure that the search was comprehensive, additional hand searches were undertaken on:

May 17th, 2017 - of the Journal of family violence using the key words "military"; "combat"; and "veteran" and the

King's centre for military health research (KCMHR) publication database (1997 - 2017).

An update of the above searches was carried out using the sources that identified articles from the initial search (i.e., Web of Science, PILOTS, MEDLINE, EMBASE and PsycInfo), from the upper date of the initial search (i.e., 17/05/2017 to 18/10/2018).

Search Terms

Potential search terms including synonyms were initially developed by reviewing words or phrases which were listed as keywords in other relevant research. Free text searches were performed combining synonyms of the term ‘Posttraumatic stress disorder’ with synonyms relating to ‘military’ service and a ‘domestic’ environment. Where possible, key words were mapped to subject headings, which were then exploded. Synonyms for each key term were linked with the Boolean operator ‘OR’. The wild card character (e.g., *) was applied to obtain possible permutations of the terms, and key terms were then linked using the Boolean operator ‘AND’. Finally, the proximity operator ‘NEAR/3’ was used to obtain articles containing any words of the key term ‘domestic’ within a three-word proximity of the word ‘violence’ and plausible synonyms. The proximity operator was adjusted depending on the database used.

An example of the search string can be seen below. The complete search syntax for each database can be found in Appendix 1.

("Posttraumatic Stress Disorder" OR "Shell Shock" OR "PTSD" OR "posttraumatic stress disorder")

AND

("armed force*" OR "ex armed force*" OR "military" OR "army" OR armies OR "service personnel" OR "soldier*" OR "combat" OR "air force*" OR RAF OR navy OR naval OR veteran* OR "war zone" OR "war-zone*")

AND

(domestic OR spous* OR partner* OR wife* OR wives OR child OR children OR family OR families OR domicil*) NEAR/3 (violen* OR beat* OR abus* OR assault* OR aggress* OR batter*) OR IPV

Study Selection

Inclusion and Exclusion Criteria

Full text studies were reviewed to determine eligibility for the current review. This was done using predefined inclusion and exclusion criteria, informed by previous studies in this area as well as discussion with the academic supervisor. To guide the development of study eligibility criteria, the *Population, Intervention/Exposure, Comparator, Outcome study design* (PICOS) framework has been widely used and recommended (Schardt et al., 2007). However, as the current review was not looking at the efficacy of an intervention, it was felt that the *Populations and their problems, Exposure, Outcomes and themes* (PEO) framework was better suited for developing inclusion and exclusion criteria (Bettany-Saltikov, 2012). Appendix 2 illustrates the PEO inclusion/exclusion criteria used to review the obtained literature.

Initially, the inclusion of qualitative and quantitative research was considered. However, only two qualitative studies were identified during the initial literature search in May 2017. Due to the limited quantitative research available to be included in this review, it was decided to exclude the two papers as it was felt that they would not reflect qualitative evidence on the subject matter accurately and reliably (Liberati et al., 2009).

Quality Assessment

All studies that were included in the review based on the PEO inclusion criteria were subject to a methodological quality assessment. Different quality assessment tools were used based on the type of study design of the articles, though all tools addressed common methodological issues in research such as selection biases, study design, measurement biases, blinding, confounding variables, and analysis and study outcomes.

Cross-sectional Studies (CSSs). Most studies that were quality assessed used a cross-sectional study design (n = 23). Cross-sectional methods are thought to weaken the quality of the study as participants are only observed at one point in time and causality of effects cannot be inferred (Mann, 2003).

To assess quality of cross-sectional studies, a minimally adapted version of the AXIS tool was used (Downes et al., 2016) and a pro forma of the tool can be found in Appendix 3. This tool was developed, specifically for the use of CSSs as tools for these types of studies have been lacking (Downes et al., 2016). Although this tool was developed using an evidence base and expertise from a range of experts in health sciences, the tool has not yet been validated. Additionally, the tool does not provide a numerical scale for assessing the quality of the study. However, to allow for interpretation of quality assessment results, items of the tool were assigned numerical rankings. Items that were endorsed "yes" received a score of 2, "partial" a score of 1 and "no" a score of 0. Item 14 (i.e., "Does the response rate raise concerns about non-response bias?") was removed from the quality assessment as research is unclear as to what "an appropriate rate [is], and no rate is automatically indicative of greater or lesser accuracy and utility" (Morton et al., 2012, p. 108). A higher total score on the quality assessment tool suggests higher reliability and validity of the results. Bearing in mind the limitations of cross-

sectional studies, only studies that achieved 60% in the quality assessment were included in this review[4].

Other Quantitative Studies. Other quantitative studies (case control *n*= 1; longitudinal cohort studies *n*= 3), which were included for quality assessment based on the PEO inclusion criteria, were assessed using the Effective Public Health Practice Project Quality Assessment Tool (EPHPP) (Thomas et al., 2004). A pro forma of the tool can be found in Appendix 3. The tool comes with a dictionary that includes a ranking system, classifying studies as having weak, moderate or strong methodological quality. Only studies that achieved moderate or strong classifications during quality assessment were included for data extraction.

Inter-rater Reliability Agreement

Two reviewers (NS and ZS) independently appraised the quality of the 27 included studies using the quality assessment tools. ZS suggested including 26/27 studies, whereas NS appraised 16/27 to be included in the review. Both raters agreed to include 15/27 studies (Cohen's K = - 0.49; agreement of 27.59 %). Reviewers compared scores and resolved disagreements before allocating a final appraisal score, resulting in an overall agreement to include 21 studies in the review.

Summary of Study Selection

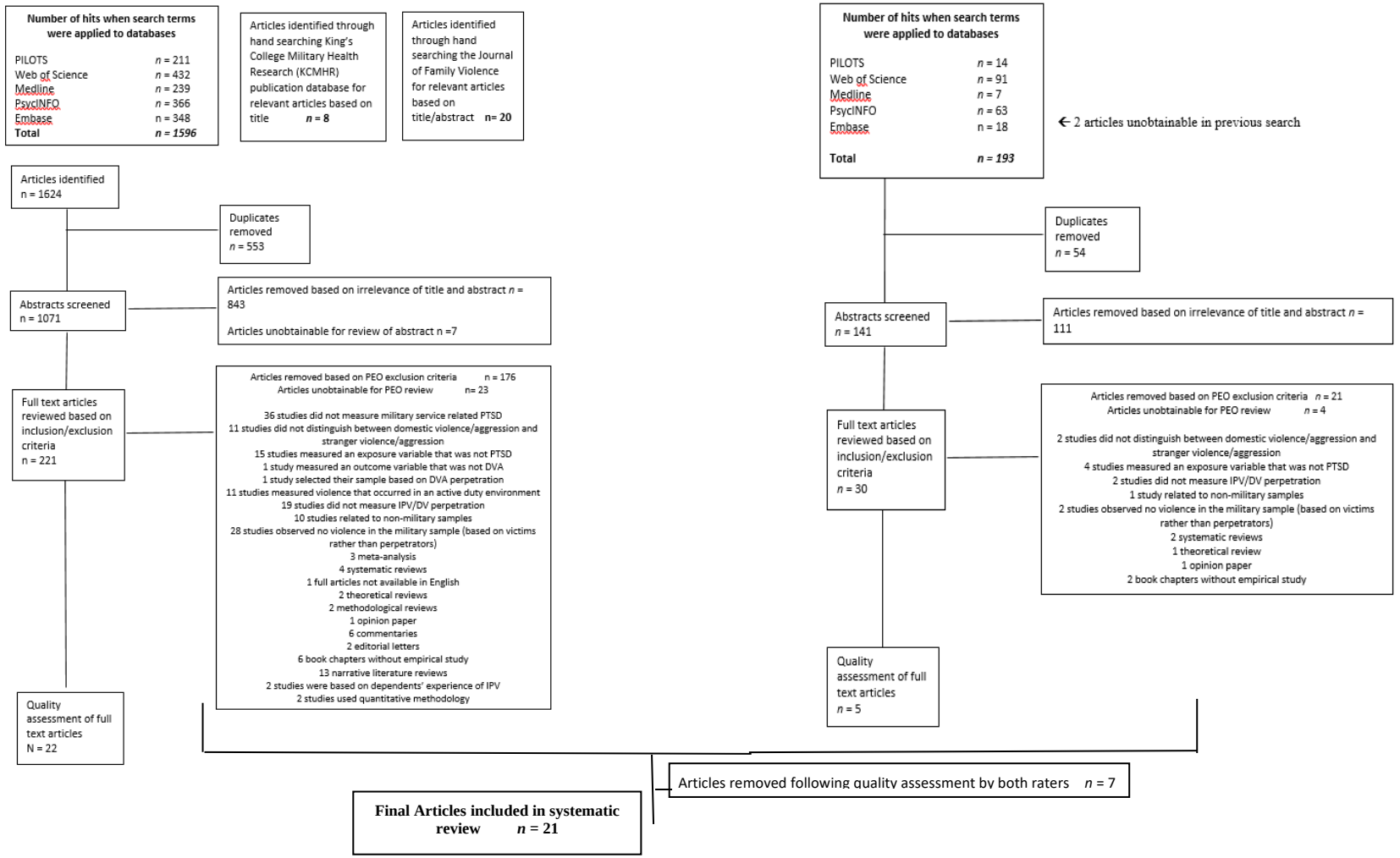
Figure 11 shows the selection process of studies included in the current systematic review. A total of 1817 articles were generated from the four databases as well as the Journal

[4] Arbitrary percentage as agreed by the researcher and supervisor.

of Family Violence and the King's College Military Health Research (KCMHR) repository. All articles were exported into RefWorks, a bibliographic database manager and 607 duplicates were removed. The abstracts of the remaining articles were screened based on relevance to the topic area and 959 papers were removed. Five articles were unobtainable for review of their abstracts, and as a result these were removed from the review too. The remaining full text articles were then reviewed based on the PEO criteria identified during the design of the review methodology. Studies were excluded if they did not meet inclusion criteria (n = 197) or the full text article was not available online (n = 27). Ideally, authors would have been contacted to obtain access to articles not freely available online, however, due to time constraints this was not done for this review. The remaining 27 articles were then quality assessed using various validated measures based on the article's research design, as previously described. This resulted in a final number of 21 full text articles, deemed methodologically rigorous, to be used for data extraction and synthesis.

Figure 11

Original and updated search flow chart



Data Extraction

Data was extracted from the 21 studies using an adapted version of a predefined data extraction form developed by the Cochrane collaboration (see Appendix 4). For each study, general information was extracted including country of origin, title and authors. Information regarding the methodology of each study was extracted including study aims, hypothesis, and whether DVA perpetration was a primary outcome of the study. Information regarding participants included sample size, type of sample, inclusion and exclusion criteria for participation in the study, mean age, sex, ethnicity, and information regarding PTSD diagnoses and military service. Data collection and study outcomes were also extracted including whether there was a collateral report of DVA, which measure was used to assess DVA, and which type of DVA was assessed in the study. Finally, information on confounding variables and the main key findings and conclusion provided by the authors were extracted from the articles.

Results

The studies included in this review explore the role of PTSD as a risk factor for domestic violence and abuse. It is of note that several studies looked at a wide range of risk factors for DVA perpetration. For the purpose of this review, however, only information relevant to the objectives of the review was extracted. Table 8 presents an overview of the participants' characteristics in the included studies as well as the studies' quality assessment rating. Table 9 presents a summary of the key characteristics of the studies and prevalence rates of DVA and PTSD where this information was reported, which will be discussed in detail.

Quality Assessment of Included Studies

The studies that were examined used different quantitative methodologies. Most studies used a cross-sectional study design and their quality assessment scores determined by both raters ranged from 61% to 89% using the AXIS tool, indicating moderate to strong methodological quality. Regarding other quantitative study designs, the longitudinal cohort study by Creech et al. (2017) was the only study to achieve a moderate or strong rating using the EPHPP tool, warranting inclusion in the review. The outcome of the quality assessments suggests that even though only studies above a 60% threshold were included for the review, they varied substantially in their methodological rigor.

Participant Characteristics of Included Studies

Participant samples ranged from 38 (Glenn et al., 2002) to 6711 (Kwan et al., 2018). Most of the studies originated from the USA except for Dekel and Solomon (2006), who used an Israeli sample, Kwan et al. (2018) who used a UK sample, and Nandi et al. (2017) who used a Burundian sample of veterans and/or serving personnel.

Nine studies used samples from clinical populations associated with the US Department of Veterans Affairs (VA) (Buchholz et al., 2017; Byrne, & Briggs, 1996; Creech et al., 2017; Hundt & Holohan, 2012; LaMotte et al., 2017a; Sherman et al., 2006; Taft et al., 2009a; Teten et al., 2010; Teten Tharp et al., 2014), whereas Glenn et al. (2002) did not specify the origin of their clinical sample. Eight studies sampled their data from community samples (Dutra et al., 2012; Jordan et al., 1992; Kwan et al., 2018; LaMotte et al., 2017b; Nandi et al., 2017; Orcutt et al., 2003; Savarese et al., 2001; Snir et al., 2017), and two studies recruited a combination of participant samples from the community as well as clinical settings (LaMotte, et al., 2016; Taft et al., 2015). It was unclear how the sample used by Dekel and Solomon (2006) was recruited and whether the former prisoners of war were drawn from a clinical setting.

It is of note that Taft et al. (2015) and LaMotte et al. (2016) used participants from the same combined clinical/community sample. Similarly, five studies recruited participants from the same community sample relating to the National Survey of Vietnam Generation (NSVG) for their studies (Dutra et al., 2012; Jordan et al., 1992; Orcutt et al., 2003; Savarese et al., 2001).

Many studies recruited male participants though one study specifically recruited only female veteran nurses (Dutra et al., 2012). Five studies recruited veteran-partner dyads (Teten et al. 2009a; Wolf et al., 2013; LaMotte et al., 2014; Teten et al., 2016; King & King, 2000) whilst three studies managed to recruit a small proportion of female participants (6.7% Buchholz et al., 2017; 12.9% Zamorski & Wiens-Kinkaid, 2013; 9% Hundt & Holohan, 2012) in addition to their male participants.

Six of the included studies included samples who had served during the Operation Enduring Freedom/Operation Iraqi Freedom war era (Creech et al., 2017; Kwan et al., 2018;

LaMotte et al., 2016; 2017a; Taft et al., 2015; Teten Tharp et al., 2014). Six studies reported having included veterans that served during the Vietnam War era (Byrne & Riggs, 1996; Dutra et al., 2012; Glenn et al., 2002; Jordan et al., 1992; Orcutt et al., 2003; Savarese et al., 2001). Three studies did not report information on the era under which their sample served (Buchholz et al., 2017; LaMotte et al., 2017b; Sherman et al., 2006). Three studies collected samples that had served in a range of war eras ranging from Vietnam to OEF/OIF to World War 2 (Hundt & Holohan, 2012; Taft et al., 2009a; Teten et al., 2010). The sample by Nandi et al. (2017) included soldiers that served in the Burundian civil war. Finally, the study by Dekel and Solomon (2006) and Snir et al. (2017) reported military service during the Yom Kippur War.

As can be seen from Table 8, information regarding the branch of military service the participants served under was not reported for thirteen studies (Buchholz et al., 2017; Byrne & Riggs, 1996; Dutra et al., 2012; Glenn et al., 2002; Hundt & Holohan, 2012; Jordan et al., 1992; LaMotte et al., 2017a; 2017b; Orcutt et al, 2003; Savarese et al 2001; Sherman et al., 2006; Snir et al. 2017; Teten Tharp et al., 2014).

Psychometric Assessment Tools

Measures Used to Assess DVA

Most studies used the Conflict Tactics Scale (CTS; Straus, 1979) and/or the Revised Conflict Tactics Scale (CTS2; Straus et al., 1996), a self-report measure for different types of family violence. The CTS consist of three scales: *violence* (changed to *physical assault* in the CTS2); *verbal aggression* (changed to *psychological aggression* in the CTS2); and *reasoning* (changed to *negotiation* in CTS2). Additionally, the CTS2 introduced the sexual coercion

scale as well as the injury subscale to measure partner-inflicted injury (e.g., bone or tissue damage) (Straus et al., 1996). The CTS as well as the revised CTS2 have been widely validated and used in many studies exploring IPV (Calvete et al., 2007; Signorelli et al., 2014; Vega & O'Leary, 2007).

Some studies only used the violence scale of the CTS (e.g., Glenn et al., 2002 or Jordan et al., 1992), or the physical assault scale of the CTS2 (e.g., Taft et al., 2015) to measure violence towards partners. Six studies used the CTS2 to measure both physical assault and psychological aggression (Byrne & Riggs, 1996; Creech et al., 2015; Dutra et al., 2012; LaMotte et al., 2017a/2017b; Savarese et al., 2001). Teten Tharp et al. (2014) was the only study to use scales from both the CTS and the CTS-2 measures to assess verbal, physical as well as sexual aggression. The study by Dutra et al. (2012) reports that they measured psychological and physical aggression using the CTS scale, however, these are features of the CTS2, so it is unclear whether they used the CTS2 as well to inform their data collection.

In terms of other measurement tools, the study by Byrne and Riggs (1996) used the Psychological Maltreatment of Women Inventory (PMWI) (Tolman, 1989) and the study by Glenn et al. (2002) used the Cook-Medley Hostility Scale – short form (Barefoot, Dodge, Peterson, Dahlstrom, & Williams, 1989), in addition to scales from the CTS/CTS-2. The study by LaMotte et al. (2016) used the Articulated Thoughts in Simulated Situations (ATSS) paradigm (Davison et al., 1983) to assess aggressive articulations and intentions towards partners. Using provocative scenarios, the authors were able to capture articulations of aggressive intention as they occurred in a safe laboratory environment. Two studies did not use a validated tool to measure DVA perpetration though devised questions to qualitatively distinguish DVA perpetrators from non-perpetrators (Hundt & Holohan, 2012; Kwan et al., 2017).

Most of the included studies based their DVA measure on veteran self-reports, though two studies also collected partner reports of veteran perpetrated violence (Dutra et al., 2012; Sherman et al., 2006); none used past convictions as a measure of DVA.

Measures Used to Assess PTSD

Across the twenty-one included studies, various tools were used to assess symptoms of PTSD, all of which have been empirically validated. Studies that measured symptoms of PTSD even if these did not meet threshold for a PTSD diagnosis were included. Byrne and Riggs (1996) and Taft et al. (2015) used the PTSD Checklist- Military version (PCL-M; Weathers et al., 1991) whilst six studies used the Mississippi Scale for Combat-Related PTSD (M-PTSD; Keane et al., 1988) (Dutra et al., 2012; Glenn et al., 2002; Jordan et al., 1992; Orcutt et al., 2003; Savarese et al., 2001; Taft et al., 2009a). The PTSD checklist for civilians (PCL-C; Ruggiero et al., 2003) was used by Buchholz et al. (2017), Hundt and Holohan (2012), as well as Kwan et al. (2017). One study used the PTSD checklist (PCL; Blanchard et al., 1996) (LaMotte et al., 2017b).

Furthermore, four studies used the Clinician administered PTSD scale (CAPS) (Creech et al., 2017; Glenn et al., 2002; LaMotte et al., 2016; 2017a), which has been described as the gold standard tool for assessing PTSD (Weathers et al., 2001) and has been described in detail in Chapter two.

Additionally, information regarding the measure used to assess PTSD was not described for the studies by Dekel and Solomon (2006), Sherman et al. (2006), Teten et al. (2010) and Teten Tharp et al. (2014). Glenn et al. (2002) was the only study to use the PTSD Keane Scale (a scale from the Minnesota Multiphasic Personality Inventory; Butcher et al., 1989), Nandi et al. (2017) used the PTSD Symptom Scale Interview (PSS-I) (Foa et al.,

1993), and Snir et al. (2017) was the only study to use the PTSD Inventory (PTSD-I; Solomon et al., 1993).

Key Findings Extracted From the Studies

PTSD Symptoms and Their Relationship With DVA Perpetration

As can be seen in Table 9, several studies reported PTSD diagnosis to be associated with increased levels of DVA in veterans. A significant association was found for physical aggression (Buchholz et al., 2017; Byrne & Riggs, 1996; Dekel & Solomon, 2006; Dutra et al., 2012; Hundt & Holohan, 2012; Jordan et al., 1992; Kwan et al., 2018; LaMotte et al., 2017a; 2017b; Orcutt et al., 2003; Savarese et al., 2001; Sherman et al., 2006; Taft et al., 2009a; 2015; Teten et al., 2010) and injury aggression (Buchholz et al., 2017), threats of violence (Jordan et al., 1992; LaMotte et al., 2016) as well as psychological aggression (Byrne & Riggs, 1996; Dutra et al., 2012; LaMotte et al., 2017a; Savarese et al., 2001; Taft et al., 2009a; Teten et al., 2010) and verbal aggression (Byrne & Riggs,1996; Dekel & Solomon, 2006). Only the study by Teten Tharp et al. (2014) collected data using the sexual coercion sub scale of the CTS-2 and found that PTSD symptoms were not significantly associated with partner sexual abuse in their sample of help-seeking veterans.

Although significant correlations between PTSD and violence have been reported, when exploring this relationship further and controlling for confounding variables, some studies found that PTSD was not independently associated with physical aggression and violence (Buchholz et al., 2017; Dutra et al., 2012; Nandi et al., 2017; Orcutt et al., 2003; Snir et al., 2017) or psychological violence (Dutra et al., 2012; LaMotte et al., 2017b). An independent effect for overall PTSD symptoms on DVA was observed for two clinical samples associated with the US Department of Veteran Affairs (Byrne & Riggs, 1996,

Sherman et al., 2006), one UK community sample (Kwan et al., 2018), one US community samples (Orcutt et al., 2003), and one US mixed sample (LaMotte et al., 2017b).

Whilst the above studies looked at overall PTSD severity, some studies considered the individual symptom clusters and their association with DVA. The hyper arousal symptom cluster was found to have the most frequent association with DVA (Dutra et al., 2012; Savarese et al., 2001; Taft et al., 2009a; 2015). Whilst Dutra et al. (2012) found that this association was not independent once controlling for other variables, Savarese et al. (2015) found a significant direct effect of hyper arousal symptoms on both physical and psychological aggression. Taft et al. (2009a) also reported a significant direct effect of hyper arousal symptoms on psychological aggression (accounting for 12% of variance) though not for physical aggression. Instead, the authors reported a direct effect between re-experiencing/avoidance symptoms and physical aggression for their sample of female veterans.

Prevalence of PTSD Amongst Veterans Who Perpetrated DVA

Only seven studies reported prevalence rates for the number of veterans with and without PTSD who engaged in DVA, which allowed for the calculation of relative risk (RR) (see Table 9). The remaining authors of the included studies were contacted for this information except for Savarese et al. (2015), Jordan et al. (1992), Glenn et al. (2002) and Nandi et al. (2017) as correspondence details had not been specified or the email was not delivered. Due to the limited number of studies reporting prevalence information it was not possible to calculate a pooled risk ratio across the studies.

Looking at the relative risk calculations for the studies for which this information was available, RR values ranged from 1.06 to 12.7. Interestingly, when comparing the RR rates for the study by Sherman et al. (2006), veteran self-reported RR rate was almost 3-fold that of

the combined veteran and partner's rate, which contradicts research suggesting under-reporting of self-reported violence (e.g., Teten Tharp et al., 2014). Furthermore, the RR for the sample of Taft et al. (2009a) suggests that having PTSD minimally increases the likelihood of engaging in physically assault (RR = 1.06) and psychological assault (RR = 1.08).

Table 8

Participant characteristics of included studies

Article	Country of study	Sample	Mean Age (M, SD*)	Male	Female	Marital status	War era	Branch of military service	Quality appraisal score
1. Buchholz et al. (2017)	USA	810 veterans from the Dept. of Veteran Affairs substance use disorder clinic, substance use intensive outpatient, and mental health clinics	M = 48.10 years (SD = 13.27)	756 (93.3%)	54 (6.7%)	68.9% not partnered, 31.1% partnered	-----	----	NS: 72% ZS: 83.3% (AXIS)
2. Byrne, & Riggs. (1996)	USA	50 veterans accessing a Dept. of Veterans Affairs Medical Centre	M = 48.76 years (SD = 4.96)	50 (100%)	----	100% partnered	Vietnam	----	NS: 69.4 % ZS: 80.6 % (AXIS)

3. Creech et al. (2017)	USA	Clinical sample of 125 veterans who had previously participated in a study evaluating the Strength at Home Men's program (SAH-M). This program is associated with the Dept. of Veterans Affairs. Participants were assigned to either an active treatment (SAH-M) group, or a control group receiving treatment after a 6 month waiting period (enhanced treatment as usual; ETAU).	----	125 (100%)	---	Married: 45 Separated or Divorced: 28 Dating or Engaged: 31 Single: 16 Unreported: 4	Iraq and Afghanistan	Air Force: 7 Army: 62 Marines: 23 Navy: 15 Unreported: 18	Agreed rating: Strong (EPHPP)
4. Dekel & Solomon. (2006)	Israel	110 former Prisoners of War (POW). It was unclear how POWs were sampled. Control group (*n* =106) sampled from the Israel Defence Forces computerized data banks.	M = 53.51 years (SD = 4.35)	216 (100%)	----	Former POWs were married or had a partner at the time of the study. No information reported for control group.	Yom Kippur War	Israeli army land forces	NS: 63.8% ZS: 80.6 % (AXIS)

5. Dutra et al. (2012)	USA	Community sample (*n* = 89) of veteran nurses derived from the National Survey of the Vietnam Generation (NSVG) components of the National Vietnam Veterans Readjustment Study (NVVRS)	M = 24.8 years (SD = 5.0)	----	89	Veterans and their partners had been together for an average of 14.5 years (SD = 5.5).	Vietnam	----	NS: 69.4% ZS: 72.2% (AXIS)
6. Glenn et al. (2002)	USA	38 veterans recruited from an outpatient PTSD clinic. The study did not specify whether this clinic was associated with the Dept. of VA.	M = 49.3 years (SD = 2.6)	38 (100 %)	----	92% percent were married or remarried. 8% were divorced	Vietnam	----	Agreed rating: 72.2% (AXIS)
7. Hundt, & Holohan (2012)	USA	Clinical sample (*n* = 264) presenting for outpatient mental health treatment at a VA hospital clinic.	M = 43.10 years, (SD = 14.10)	91%	9%	----	62% Vietnam war, 38% Persian Gulf or OEF/OIF/Operation New Dawn	----	NS: 66.6% ZS: 77.8% (AXIS)

8. Jordan et al. (1992)	USA	Community sample derived from the National Survey of the Vietnam Generation (NSVG) components of the National Vietnam Veterans Readjustment Study (NVVRS) 319 veterans with PTSD (cases) 871 veterans without PTSD (controls)	Cases: M =39.8 years (SD = not reported). Controls: M = 41.81 years (SD = not reported).	1190 (100%)	----	Controls: 77.8% married, 5.2 % living as married, 1.1% separated, 11.1% divorced, 0.1% widowed, 4.8% never married Cases: 62.7% married, 14.% living as married, 8.5% separated, 5.2% divorced, None widowed, 9.6% never married	Vietnam	----	Agreed rating: 77.8% (AXIS)

9. Kwan et al. (2018)	UK	Randomly selected community sample of *n* = 6711 veterans from a larger cohort study 5741 regular personnel and 970 reserves	Median age = 33.2 years (Inter Quartile Range = 27.2–40).	6061 (91.9 %)	650 (8.1%)	Married, living together or in a long-term relationship: 5112 (77.6%) Single, divorced or widowed: 1567 (22.4%)	Iraq and Afghanistan	Royal Navy and Royal Marines (11.1%) Army 4666 (71.2%) RAF 1233 (17.7%)	NS: 77.7% ZS: 86% (AXIS)

10. LaMotte et al. (2016)	USA	Clinical sample associated with a dept. of VA and associated outpatient clinics. Community sample of veterans that consented to be contacted about on-going research at national centre for PTSD Community sample from roster of veterans living in Massachusetts, held by the Defence Manpower Data Centre	M = 40.15 years (SD =9.59)	82 (100%)	----	82.9% married and cohabitating 9.8 % unmarried but cohabitating 7.3 % married and separated	OEF/OIF	63.4% Army, 15.9 % Marines, 11% Navy, 9.8 % Air Force	NS: 72.2% ZS: 80.5% (AXIS)

11. LaMotte et al. (2017a)	USA	103 veterans recruited from a Dept. of VA Translational Research Centre for Traumatic Brain Injury (TBI) and Stress Disorders (TRACTS)	M = 33.73 years (SD = 9.03)	89	14	40% married, 7.8% separated, 11.7% divorced, 29.1% never married, 1.0% widowed, 7.8% other (e.g., cohabiting), 2.9% missing information	OEF/OIF	----	Agreed rating: 63.9% (AXIS)
12. LaMotte et al. (2017b)	USA	Community sample of veterans	M = 40.37 years (SD =9.63)	92 (100%)	----	79.3% married and cohabitating 10.1% unmarried but cohabitating 9.8 % married and separated	----	---	NS: 75% ZS: 89 % (AXIS)
13. Nandi et al. (2017)	Burundi	Community sample of Burundian male soldiers who returned from deployment to Somalia	35.64 years old (SD = 4.76)	381 (100%)	----	Almost 88% of the sample were married	Burundi civil war	----	NS: 66.6 % ZS: 83% (AXIS)
14. Orcutt et al. (2003)	USA	This study used existing data from participants in the National Vietnam	----	376	----	----	Vietnam	----	NS: 61.1 % ZS: 75% (AXIS)

		Veterans Readjustment Study.		(100%)					
15. Savarese et al. (2001)	USA	This study used existing data from participants in the National Vietnam Veterans Readjustment Study.	----	376 (100%)	----	----	Vietnam	----	NS: 61% ZS: 83% (AXIS)
16. Sherman et al. (2006)	USA	Couples who presented at a Dept. of VA outpatient family therapy clinic Cases: 60 (PTSD) Cases: 68 (Depression) Controls: 51	PTSD cases: M = 51.4 years (SD = 8.8) Controls: M = 48.7 years (SD = 11.6)	179 (100%)	----	92% of overall sample was married; 8% of overall sample cohabitating but not married	----	----	Agreed rating: 69.4% (AXIS)
17. Snir et al. (2017)	Israel	Community subsample of existing data from a larger longitudinal study.	M = 53.6 years (SD = 4.56)	230 (100%)	----	93.4 % married	Yom Kippur War	----	Agreed rating: 77.7% (AXIS)

18. Taft et al. (2015)	USA	Clinical sample associated with a Dept. of VA and associated outpatient clinics. Community sample of veterans that consented to be contacted about on-going research at national centre for PTSD Community sample from roster of veterans living in Massachusetts, held by the Defence Manpower Data Centre	M = 40.37 years (SD = 9.63)	92 (100%)	----	79.3% married and cohabitating, 10.1% had a live-in relationship partner, 9.8% were married and separated	OEF/OIF	Army (63.0%), Marine Corps (17.4%), Navy (10.9%), and Air Force (8.7%).	NS: 72.2% ZS: 89% (AXIS)

19. Taft et al. (2009a)	USA	Clinical sample of veterans presenting at a Dept. of VA PTSD clinic Partnered veterans *n* = 161 who were in a relationship in the year prior to data collection Non-partnered veterans *n* = 75	M = 53 years (SD = 12)	263 (100%)	----	45% married, 29% divorced or separated, 11% never married, 4% had a live-in relationship partner, 1% widowed.	63% Vietnam War, 11% Operation Desert Storm, 5% Operation Iraqi Freedom, 1% Operation Enduring Freedom, 2% Korean War, 2% World War II, 9% served during other eras	50% Army, 24% Marines, 7% Navy, 5% Air Force 5% National Guard	NS: 80.5% ZS: 83% (AXIS)
20. Teten et al. (2010)	USA	Clinical sample (*n* = 86) who completed a routine diagnostic screening for PTSD at a regional VA medical centre outpatient PTSD clinic. 18.6% were currently on active duty.	----	86 (100%)	----	----	59 participants served in Vietnam war, 33 participants OEF/OIF, 2 participants served in both ears.	57.0% Army, 8.1% Navy, 23.3% Marines, 2.3% Air Force, 3.5% National Guard, 5.8% served in multiple branches	NS: 66.6% ZS: 83% (AXIS)

21. Teten Tharp et al. (2014)	USA	Clinical sample of 100 couples seeking relationship therapy at the Family Mental Health Program, an outpatient family therapy clinic in a mid-Western VA Medical Centre.	Men M = 31.3 years (SD = 7.4)	100 (100%)	----	85% were married 25% were cohabiting but not married	OEF/IEF	----	NS: 69.4% ZS: 75% (AXIS)

Table 9

Data extracted from included studies

Article	Study aim	Measure of combat related PTSD	Measure of DVA	Type of violence assessed	Main findings	Prevalence of PTSD and DVA including Relative Risk (RR)	Conclusions

1. Buchholz et al. (2017)	The authors examined both partner and non-partner violence, and investigated to what extent substance use and probable PTSD are related to physical violence and violence perpetration that leads to injury of another person.	PTSD Checklist for civilians (PCL-C)	Revised Conflict Tactics Scale (CTS2)	Physical aggression (less severe violence) and injury aggression (more severe violence)	187 participants (23.1%) reported perpetrating partner physical aggression. 76 participants (9.4%) reported perpetrating partner injury aggression in the past year. Probable PTSD was associated with higher rates of physical aggression towards partners ($p = 0.001$). Probable PTSD was also associated with injury aggression towards partners ($p = 0.011$). However, regression analysis showed that when controlling for sociodemographic factors, probable PTSD was not independently associated with partner physical aggression or injury aggression.	*PTSD* With PTSD: 317/810. Without PTSD: 493/810. *Physical aggression* With PTSD: 93/317 Without PTSD: 94/493 RR = 1.538660313 *Injury aggression* With PTSD: 40/317 Without PTSD: 36/493 RR = 1.728005608	Substance using veterans with PTSD are 1.5 times more at risk of engaging in partner physical aggression compared to those without PTSD. Substance using veterans with PTSD are 1.7 times greater at risk of engaging in partner injury aggression compared to those without PTSD.

2. Byrne & Riggs, (1996)	The authors examined the relationship between PTSD symptom and physical aggression, verbal aggression and psychological aggression within intimate relationships. The authors also considered combat exposure as a confounding variable for this relationship and looked at the mediating effects of relationships.	PTSD Checklist Military Version (PCL-M)	Conflict Tactics Scale (CTS) Psychological Maltreatment of Women Inventory (PMWI)	Physical aggression Verbal aggression Psychological aggression	34% of veterans self-reported having engaged in at least one act of violence against; 92% self-reported engaging in verbal aggression, and 100% reported using psychological aggression against their partner during the past year. Women partners' reports of victimization were comparable. The authors found that veterans' PTSD symptoms were directly related to their reports of verbal ($p < .0001$), physical ($p < .01$) and psychological aggression ($p < .0001$) against their intimate partners. Using regression analysis, the authors found that relationship problems mediated the positive association between veteran's PTSD symptomatology and their use of aggression within their intimate relationships ($p < .001$).	*This information has been taken from Trevillon et al. (2015) as authors did not report prevalence in their paper. Trevillon et al. (2015) clustered verbal and psychological aggression.* *PTSD* With PTSD: 26/50 Without PTSD: 24/50 *Physical violence* With PTSD: 12/26 Without PTSD: 4/24 RR = 2.769231 *Psychological abuse* With PTSD: 25/26 Without PTSD: 21/24 R = 1.098901	Veterans with PTSD are 2.7 times at greater risk of engaging in physical violence compared to those without PTSD. PTSD is not associated with an increased risk in respect of perpetrating psychological abuse.

3. Creech et al. (2017)	The authors investigated whether untreated PTSD could predict intimate partner aggression. They also explored the effect of pre-treatment PTSD rates on rate of psychological and physical aggression over time between those that were receiving treatment (strength at home men's program SAH-M; cases) and those who experienced a 6 month delay in receiving this treatment (enhanced treatment as usual ETAU; controls) to establish the impact of PTSD on treatment effectiveness.	Clinician Administered PTSD Scale (CAPS-5)	Revised Conflict Tactics Scale (CTS2)	Psychological aggression Physical aggression	Intimate partner physical aggression decreased by 56% following treatment, of which the greatest shift was made within the first three months of receiving treatment. There was no difference between the two conditions (immediate or delayed treatment) in terms of reducing intimate partner aggression suggesting that immediate or delayed receipt of treatment did not affect effectiveness of treatment. The effect for psychological aggression was moderate. Reports of psychological aggression was 19% lower for those who had received treatment, compared to those who were awaiting treatment. Again, the greatest shift was within the first three months of receiving treatment with a 50% reduction in reported incidents of psychological aggression. There was no difference between the conditions. Pre-treatment PTSD was found to have a small effect on treatment effectiveness for psychological aggression but not physical aggression.	*PTSD:* With: 69/125 Without: 59/125 *Psychological aggression* With PTSD: not described Without PTSD: not described *Physical aggression* With PTSD: not described Without PTSD: not described	Authors contacted for prevalence data.

4. Dekel & Solomon, (2006)	The authors compared former Prisoners Of War (POWs) with and without PTSD as well as a control group of veterans (without PTSD) on their level of aggression, and sexual satisfaction in their marital relations.	A self-report questionnaire not further specified.	Conflict Tactics Scale (CTS)	Verbal aggression Physical aggression	The number of PTSD symptoms reported by the former POWs correlated with verbal aggression ($r = .41$, $p < .001$) and physical aggression ($r = .23$, $p < .05$). The findings show that former POWs with PTSD reported significantly poorer marital adjustment, heightened physical aggression, and less sexual satisfaction than did the former POWs without PTSD and the control group veterans.	*Former POWs*: Yes PTSD 25/124 No PTSD: 85/124. *Control group:* 104 veterans with no PTSD. *Verbal aggression* With PTSD: not described Without PTSD: not described *Physical aggression* With PTSD: not described Without PTSD: not described	Authors contacted for prevalence data.

5. Dutra et al. (2012)	The authors assessed rates and correlates of both physical and psychological aggression perpetrated by female veterans against their male partners.	Mississippi Scale for Combat-Related PTSD (M-PTSD)	Conflict Tactics Scales (CTS)	Physical aggression Psychological aggression	22.2% of the male partners reported that their female partners had perpetrated physical aggression over the previous year, while only 12.2% of the male partners reported having been physically aggressive toward their female partners. There was no gender difference for psychological aggression. Effect sizes for psychological aggression were comparable for the re-experiencing and numbing/avoidance cluster ($p < .05$), though strongest for the hyper arousal symptom cluster ($p < .01$). The hyper arousal was also the only symptom cluster significantly associated with physical partner aggression ($p < .05$). However, further regression analysis showed that PTSD hyper arousal symptoms were not a significant correlate of either form of female-perpetrated aggression once other correlates were accounted for. (The authors only included the hyper arousal symptoms in their regression analysis as these symptoms were the strongest bivariate correlate of physical and verbal aggression).	*PTSD* Yes PTSD: not described No PTSD: not described *Physical aggression* With PTSD: not described Without PTSD: not described *Psychological aggression* With PTSD: not described Without PTSD: not described	Author contacted for prevalence rates.

6. Glenn et al. (2002)	The authors explored the relationship between the veterans' combat exposure, PTSD and violence with their partner's and children's levels of psychological distress and perpetrated violence and hostility (towards the veteran).	Clinician Administered PTSD Scale (CAPS-IV) Mississippi Scale for Combat-Related PTSD (M-PTSD) PTSD Keane Scale (PK)	Cook-Medley Hostility Scale Violent Behaviour Index (VBI) - Violence Subscale of Conflict Tactics Scale (CTS)	Hostile Affect, Cynicism and Aggressive Responding Physical violence	Veterans achieved elevated scores on the Aggressive Responding, Hostile Affect, and Cynicism subscales of the Cook-Medley Scale. Veterans' mean scores on the VBI fell in the medium-high range. However, the authors did not report mean scores for each subscale based on levels of PTSD (e.g. high and low PTSD scores) to allow for comparison of level of PTSD and level of perpetrated hostility and violence. Veterans' PTSD symptoms as measured by the PK scale were positively and significantly associated with their spouse/partner's ratings of hostility and general psychological distress, but not violent behaviour. Veterans' PTSD ratings on the PK scale were significantly and positively associated with violent behaviour towards their adolescent and adult children, but not hostility or psychological distress. There were no significant associations between any of the scales completed by the spouse/partner and children and the other two PTSD measures completed by the veterans.	*PTSD* Yes PTSD: 38/38 No PTSD: 0/38 *Hostility* High PTSD symptoms: not described. Low PTSD symptoms: not described. *Physical violence* High PTSD symptoms: not described Low PTSD symptoms: not described	Authors not contacted as correspondence email/details not specified.

7. Hundt, & Holohan, (2012)	To examine the associations among shame, PTSD, depression, and guilt and the perpetration of IPV.	The PTSD Checklist Civilian version (PCL-C)	Three yes or no questions 1. “When arguing, do you yell, hit objects, or throw/break things?”. 2. “Has your partner ever been afraid of your anger in the past year?”; 3. “Have you pushed, grabbed, slapped, or punched your partner in the past year?”	A dichotomous IPV variable was formed from the second and third questions (because the first could mean only yelling) and an alternate classification using only the third.	17% of veterans endorsed pushing, grabbing, slapping, or punching their partner in the past year, 42% reported that their partner was afraid of the veteran’s anger, and 55% of the veterans reported yelling or hitting/throwing/breaking objects. PTSD scores as measured by the PCL-C was significantly correlated with IPV perpetration ($p < .01$). The results indicated that shame fully mediates the relationship between PTSD and IPV; however, when depression was considered shame no longer significantly mediated the relationship between PTSD symptoms and IPV perpetration. In addition, shame was not a significant mediator of the relationship between depression and IPV when examined alone or with PTSD symptoms considered. However, in this sample, shame was most important in discriminating between perpetrators and non-perpetrators of IPV.	Prevalence data not reported. However, this information was published in Trevillion, et al. (2015) as they contacted the authors. *PTSD* Yes PTSD: 184/264 No PTSD: 80/264 *Physical violence* With PTSD: 34/184 Without PTSD: 9/80 RR = 1.642512	Veterans with PTSD are 1.6 times more at risk of engaging in partner physical violence compare to those without PTSD.

8. Jordan et al. (1992)	The authors compared the prevalence rates for marital relationship, family role, and adjustment problems in the families of Vietnam veterans who have PTSD with who do not have PTSD.	Mississippi Scale for Combat-Related PTSD (M-PTSD)	Conflict tactics scale (CTS)	Physical violence Threats of violence	Reports of family violence, both by the veteran and violence by the Spouse/partner, were significantly more prevalent among those families in which the veteran had PTSD (p = .002). The mean number of violent acts committed in the last year (including threats) by male veterans with PTSD was 4.86, compared with 1.32 among those without PTSD (p = .004). On both indices, a higher proportion of spouse/partner of male veterans with PTSD committed at least some acts of violence in the past year than did the veterans with PTSD. Although there is increased violence reported in the families of the male veteran with PTSD, about half of these veterans and their partners/spouses report no acts of violence by the veteran in the past year. Even if the veterans are somewhat underreporting these behaviours, it would suggest that there is a little or no violence in at least a sizeable minority of families in which the veteran has PTSD.	*PTSD* Yes PTSD: 871/1190 No PTSD: 319/1190 *Physical violence* With PTSD: not described Without PTSD: not described *Threats of violence* With PTSD: not described Without PTSD: not described	Authors not contacted for prevalence data as no correspondence email/details provided.

9. Kwan et al. (2018)	To compare the prevalence of and risk factors for violence against any family member as well as stranger violence among UK military personnel following return from deployment in Iraq or Afghanistan. The authors examined associations between both types of violence and post-deployment mental health problems.	PTSD checklist for civilians (PCL-C)	No validated measure.	Physical violence	After adjusting for confounding variables, family violence was significantly associated with having left service (p = .036), deployment in a combat role (p = .003), symptoms of PTSD (p = .013), common mental disorders (p < .001) as well as self-reported levels of moderate aggression (p = .003) and high aggression (p < .001).	*PTSD* Yes PTSD: 253 No PTSD: 6033 *Physical violence:* With PTSD: 43/253 Without PTSD: 171/6033 RR = 6.0	PTSD was associated with a 6-fold increase in risk of perpetrating partner physical violence.

10. LaMotte et al. (2016)	The authors investigated whether laboratory exposure to trauma cues potentiated the relationship between veterans' PTSD symptoms and intimate partner aggression (IPA) during an anger-induction task.	Clinician Administered PTSD Scale (CAPS-IV)	ATSS IPA Articulations	physical intimate partner aggression (IPA) articulations (i.e., expressions of physically aggressive intentions toward the partner) and verbal IPA articulations (i.e. statements intended to insult or demean the partner)	PTSD symptom severity was significantly associated with *physical* IPA articulations made after a trauma cue* (p = .006) than before given a trauma cue (p = .296). PTSD symptoms severity was significantly associated with *verbal* IPA articulations in both the trauma cue condition (p = .002) and the non-trauma cue condition (p = .004). * a recording of a personalised trauma script developed from the veterans' structured PTSD interviews	*PTSD* Yes PTSD: 38 No PTSD: 44 *Physical IPA articulation* With PTSD: not described Without PTSD: not described *Verbal IPA articulation* With PTSD: not described Without PTSD: not described	Author contacted for prevalence rates.

11. LaMotte et al. (2017a)	The authors explored how sleep problems and physical pain moderate the relationship between intimate partner aggression (IPA) and general aggression (GA) among UK veterans.	Clinician Administered PTSD Scale (CAPS	Revised Conflict Tactics Scales (CTS2)	Physical intimate partner aggression (IPA) Psychological intimate partner aggression (IPA)	PTSD symptoms were significantly associated with physical IPA ($p < .05$) and psychological ($p < .001$).	*PTSD* Yes PTSD: not described No PTSD: not described *Physical IPA* With PTSD: not described Without PTSD: not described *Verbal IPA* With PTSD: not described Without PTSD: not described	Author contacted for prevalence rates.

12. LaMotte et al. (2017b)	The authors explored social skills deficits (e.g., problem solving skills) as a mediator for the relationship between PTSD and intimate partner aggression (IPA).	PTSD Checklist (PCL)	Revised Conflict Tactics Scales (CTS2)	Physical aggression Psychological aggression	Combined reports of veterans and their partners indicated that 27.7% veterans and 38.5% partners had perpetrated physical IPA, and that 96.9% of veterans and 95.4% of partners had perpetrated psychological IPA. The direct effect of PTSD symptoms on the use of physical IPA was significant (p = .007) but the indirect effect through social skills deficits was not significant (p = .03). The direct effect of PTSD symptoms on the use of psychological IPA was not significant (p = .090) but the indirect effect through social skills deficits was significant. Findings indicated that the partners of veterans perpetrated more physical IPA than did the veterans themselves.	*PTSD* Yes PTSD: not described No PTSD: not described *Physical aggression* With PTSD: not described Without PTSD: not described *Psychological aggression* With PTSD: not described Without PTSD: not described	Author contacted for prevalence rates.

13. Nandi et al. (2017)	The authors explored if war trauma exposure, childhood familial violence, PTSD and depression symptom severity, as well as appetitive aggression (the perception of violence as fascinating, appealing and thrilling) could predict Burundian Soldiers' violence after having returned from deployment.	PTSD Symptom Scale-Interview (PSS-I)	Checklist for childhood familial violence administered from the perpetrator's perspective	Assessed for violence against their child and partner though type of violence not described.	60% of the soldiers reported at least one violent act against their children. 36% of the soldiers reported at least one violent act against their intimate partner. PTSD symptom severity was significantly and positively correlated with intimate partner violence ($p < .001$) and violence against their child ($p < .001$). However, path analysis showed no direct effect between violence against children or intimate partner violence and PTSD symptom severity.	*PTSD* Yes PTSD: not described No PTSD: not described *Violence against child* With PTSD: not described Without PTSD: not described *Intimate partner violence* With PTSD: not described Without PTSD: not described	Author contacted for prevalence rates.

14. Orcutt et al. (2003)	The authors examined the relationship between Vietnam veterans' early life characteristics, experiences within their family of origin, childhood and war-zone trauma history, current PTSD and physical violence towards their spouses or partners.	Mississippi Scale for combat-related PTSD	Conflict Tactics Scale (CTS; Straus, 1979)	Physical violence	There was a direct, positive effect between PTSD symptoms and intimate partner violence.	*PTSD* Yes PTSD: not described No PTSD: not described *Physical violence* With PTSD: not described Without PTSD: not described	Author contacted for prevalence rates.

15. Savarese et al. (2001)	The authors examined the relationship and interactions between veterans' drinking frequency, drinking quantity, and hyperarousal symptoms of PTSD on physical violence and psychological abuse towards their spouses.	Mississippi Scale for combat-related PTSD (Keane et al., 1988)	Conflict Tactics Scale (CTS; Straus, 1979)	Physical violence Psychological abuse	315 men (84%) reported to have engaged in at least one act of psychological abuse toward their spouse in the last year. 80 men (21%) reported to have committed one or more acts of physical violence against their spouse or partner in the last year. Hyper arousal symptoms were significantly associated with both physical violence ($p < .05$) and psychological abuse ($p < .01$). There was a significant main effect of hyperarousal on physical violence as well as psychological abuse, suggesting that greater hyperarousal symptomatology is associated with higher levels of physical violence and psychological abuse.	*PTSD* With hyper arousal symptoms: not described No hyperarousal symptoms: not described *Physical violence* With hyper arousal: not described Without hyper arousal: not described *Psychological abuse* With hyper arousal: not described Without hyper arousal: not described	Author contacted for prevalence rates. Email undeliverable.

16. Sherman et al. (2006)	The authors explored intimate partner violence in help-seeking veterans with PTSD compared to those with depression and a control group (adjustment disorder or relationship difficulties).	----	Conflict Tactics Scale, Form R (CTS)	Physical violence (rate of overall violence and rate of severe violence)	Veterans with PTSD were significantly more likely to perpetrate violence towards their partner than veterans without PTSD ($p < 0.05$). Regression analyses revealed that when controlling for age, race, alcohol use, marital satisfaction, physical health problems, previous treatment exposure and general functioning, the odds of *overall* violence for PTSD veterans were 5.4 times that for veterans without PTSD ($p < .001$), and the odds of *severe* violence for PTSD veterans were 26.4 times that for veterans without PTSD ($p < .01$).	*PTSD* Yes PTSD: 60 No PTSD: 51 **Overall violence (self-report)* With PTSD: 33/60 Without PTSD: 11/51 RR = 2.55 **Severe violence (self-report)* With PTSD: 15/60 Without PTSD: 1/51 RR = 12.75 **Overall violence (joint veteran and partner report)* With PTSD: 49/60 Without PTSD: 24/51 RR = 1.74 **Severe violence (joint veteran and partner report*) With PTSD: 27/60 Without PTSD: 5/51 RR = 4.59 *Authors reported percentage of veterans, this was rounded off to give *n* of veterans	According to veterans' self-reports, veterans with PTSD are 2.5 times at greater risk of engaging in an act of violence compared to those that to do not have PTSD. According to veterans' self-reports, veterans with PTSD are 12.7 times more at risk to engage in an act of severe violence compared to those that to do not have PTSD. According to combined reports of veterans and their partners, veterans with PTSD are 1.7 times more at risk to engage in an act of violence compared to those that to do not have PTSD. According to combined reports of veterans and their partners, veterans with

PTSD are 4.6 times more at risk to engage in an act of severe violence compared to those without PTSD.

17. Snir et al. (2017)	The authors explored the association between aggressive impulses, PTSD, paranoid ideation, and guilt and inward aggression (as manifested by suicidal ideation) vs. outward aggression (as manifested by partner violence).	PTSD Inventory (PTSD-I; Solomon et al., 1993)	Conflict Tactics Scale (Straus, 1979)	Partner violence (the authors did not distinguish between verbal aggression and physical aggression during analysis)	Partner violence was significantly and positively associated with PTSD ($p <$ .0001). There was no direct effect between PTSD and partner violence.	*PTSD* Yes PTSD: not described No PTSD: not described *Partner violence* With PTSD: not described Without PTSD: not described	Author contacted for prevalence rates.

18. Taft et al. (2015)	The authors examined social information processing biases, specifically cognitive biases and hostile attribution biases, as a mechanism through which PTSD symptoms relate to anger expression and intimate partner violence (IPV).	PTSD Checklist-Military Version (PCL-M)	Revised Conflict Tactics Scales (CTS2)	Physical assault	The combined veteran and partner report of veteran IPV indicated that 27.5% of veterans had perpetrated IPV in the past year. PTSD was significantly associated with physical violence amongst veterans ($p < .05$). Specifically, the hyper arousal (r = .27) and numbing ($r = .21$) symptom clusters were positively and significantly associated with IPV perpetration ($p < .05$).	**PTSD* Yes PTSD: 42 No PTSD: 50 **Physical violence* With PTSD: not described Without PTSD: not described *Authors reported percentage of veterans, this was rounded off to give *n* of veterans	Author contacted for prevalence rates. Response received but no follow up, see Appendix 5

19. Taft et al. (2009a)	The authors examined the relationship between PTSD symptoms, depression symptoms as well as combat exposure and general and intimate partner aggression in a sample of male veterans.	Mississippi Scale for combat-related PTSD	Revised Conflict Tactics Scales (CTS2; Straus, Hamby, Boney-McCoy, & Sugar- man, 1996)	Physical assault Psychological aggression	Among 161 combat veterans involved in an intimate relationship 33% engaged in physical aggression toward their partner in the previous year, and 91% engaged in psychological aggression toward their partner. There was a significant positive relationship between overall PTSD symptom scores and physical aggression (r = .19; p < .05) as well as psychological aggression *(*r = .23; p < .01). Specifically, there was a significant association between the re-experiencing/avoidance symptom cluster (r = .24 p < .01) and physical aggression as well as for the hyper arousal symptom cluster (r = .18; p < .05). There was also a significant positive relationship between numbing symptom cluster (r = .20; p <.05) as well as the hyper arousal symptom cluster (r = 35; p < .01) and psychological aggression. Regression analysis showed that there was a significant direct effect between re-experiencing/avoidance symptoms and physical aggression (r =. .21; p < 0.5) but not of the other symptom clusters. There was also a direct significant effect between hyper arousal symptoms (r = .33; p = < .01) and psychological aggression but the effect of the other symptom clusters did not reach significance.	Prevalence data not reported. However, this information was published in Trevillion, et al. (2015) as they contacted the authors. *PTSD* Yes PTSD:126/161 No PTSD: 26/161 *Physical assault* With PTSD: 41/126 Without PTSD: 8/26 RR = 1.06 *Psychological aggression* With PTSD: 115/126 Without PTSD: 22/26 RR = 1.08	PTSD was not associated with an increased risk of engaging in physical assault or psychological aggression. It is of note that the no PTSD group had substantial levels of subthreshold PTSD, which may explain why the authors found comparable risk between the two groups.

20. Teten et al. (2010)	The authors examined differences between veterans with and without PTSD to understand how partner aggression and comorbid disorders may be represented amongst a sample of OEF/OIF and Vietnam veterans.	Routine diagnostic screening for PTSD. No measure described.	Conflict Tactics Scale–Revised (CTS2)	Psychological Aggression, Physical Assault Physical Injury	OEF/OIF veterans with PTSD reported significantly more frequent psychological aggression (p = .03), toward a partner in the past year compared to OEF/OEF veterans without PTSD. There was no significant association between OEF/OIF veterans with and without PTSD and physical aggression or injury aggression. No significant group difference was observed in aggression between OEF/OIF veterans with PTSD and Vietnam veterans with PTSD.	*OEF/OIF veterans PTSD* Yes PTSD: 27/59* No PTSD: 31/59* (2 excluded; numbers do not add up as two veterans served in both conflicts) *Vietnam veteran's PTSD* Yes PTSD: 31/35 No PTSD: 2/35 (2 excluded) (overall, 8 veterans excluded from analysis) **Physical assault* With PTSD: 24/86 Without PTSD: 12/86 RR = 2 **Psychological aggression* With PTSD: 48/86 Without PTSD: 25/86 RR = 1.92 **Physical injury* With PTSD: 15/86 Without PTSD: 4/86 RR = 3.75 *RR compared for overall sample, rather than distinguishing between OEF/OIF and	Veterans with PTSD are 2 times at greater risk to physically assault their partner compared to veterans without PTSD. Veterans with PTSD are 1.92 times at greater risk to perpetrated psychological aggression toward their partner compared to veterans without PTSD. Veterans with PTSD are 3.75 at greater risk to cause physical injury to their partner compared to veterans without PTSD.

Vietnam veterans due
to excluded data)

21. Teten Tharp et al. (2014)	The authors sought to describe the frequency, gender differences, and agreement in couples' reports of IPV, whether this was one-sided or mutual and whether frequency or pattern of violence is associated with veteran diagnosis of PTSD.	Veterans were coded as having PTSD if they had a primary or secondary diagnosis of PTSD in their medical record.	Conflict Tactics Scale (CTS) Revised Conflict Tactics Scale (CTS-2).	Verbal aggression Physical aggression Sexual coercion	Perpetrators were likely to underreport their violence. Partner agreement about the occurrence of violence varied based on type of IPV, from high correspondence on verbal aggression to low correspondence on sexual coercion. Aggression among veterans and their partners was not significantly correlated with veteran PTSD diagnosis (p = .61). There was also no significant association between veteran PTSD and the different types of violence (p = .61). Chi-square tests indicated that pattern of violence was not associated with veteran diagnosis of PTSD, χ^2 = 0.44, p = .80, or ethnicity, χ^2 = 5.52, p = .06. Instead, 56% (non-violent) to 65% (mutually violent) of the veterans in each violence pattern had a diagnosis of PTSD.	*PTSD* Yes PTSD: 46/100 No PTSD: 54/100 *Verbal aggression* With PTSD: not described Without PTSD: not described *Physical aggression* With PTSD: not described Without PTSD: not described	Author contacted for prevalence rates. Response received, see Appendix 5

Discussion

Research has suggested that veterans or active service personnel with PTSD are more likely to exhibit domestic violence or abuse towards their partners compared to those without PTSD. This review looked at synthesising findings of methodologically rigorous research on PTSD as a risk factor for DVA. Specifically, it was of interest to calculate relative risk of having PTSD in respect of DVA perpetration. Application of inclusion criteria and quality assessment of the results of the literature searches identified 21 quantitative papers for inclusion in the current review. This review did not include qualitative research as only two qualitative studies were identified during the literature search process, a surprisingly small number given that the impact of military service on mental health and other outcomes has received a lot of public attention over the last few years (Gerlock et al., 2016). Supplementing electronic searches with hand searches as well as using broad inclusion criteria allows confidence in the conclusion that all relevant quantitative research was included in this review.

The Relationship Between PTSD and Domestic Violence and Abuse (DVA)

Firstly, it was noticed that although the PEO inclusion criteria for eligible studies was defined to include violence towards any member of the family, all but two included studies (i.e., Glenn et al., 2002; Kwan et al., 2017) measured violence towards an intimate partner only. Whilst the studies highlighted that veteran PTSD scores were significantly associated with the prevalence of physical and psychological aggression as well as injury of the partner (when adjusting analysis for confounding variables), an independent effect of PTSD

symptoms on DVA perpetration was only observed in six studies (Kwan et al., 2018; LaMotte et al., 2017b; Orcutt et al., 2003; Savarese et al., 2001; Sherman et al., 2006; Taft et al., 2009a). This could be due to the presented research varying greatly in their research questions and methodological approach; some considering a range of other variables in relation to DVA perpetration. For example, Taft et al. (2015) found that cognitive biases (e.g., irrational judgment) significantly mediated the association between total PTSD scores and the expression of anger. In another example, King and King (2000) report an interaction between hyper arousal symptoms and alcohol abuse on partner violence, though Buchholz et al. (2017) found that probable PTSD was not significantly associated with partner physical or partner injury violence after adjustment for other variables such as drug use, and heavy drinking. Therefore, it is evident that any mediatory effects are dependent on the sample and variables under investigation. The same issue was evidenced in the systematic review by Marshall et al. (2005). Furthermore, the link between PTSD and sexual violence remains unexplored in the current review as only one study (e.g., Teten Tharp et al., 2014) explored the relationship between PTSD and sexual violence. Teten Tharp et al. (2014) explored bi-directional violence in partner dyads where the male partner was a veteran with PTSD, using both partner's reports of violence. The authors found that male veterans reported higher rates of sexual coercion compared to their female partners but noted that the lowest correspondence between partners' reports was for sexual violence compared to verbal and physical aggression.

Secondly, there was some consensus amongst the included papers in terms of hyper arousal symptoms of PTSD showing the greatest association to DVA. Hyper arousal is characterised by "being irritable and having angry outbursts; behaving recklessly or in a self-destructive way; being easily startled; or having problems concentrating or sleeping" (DSM-5; American Psychiatric Association, 2017, para. 5). Research has highlighted how these

symptoms may correlate with violence due to their wider physiological effects. For example, individuals with PTSD were found to have higher resting heart rates compared to individuals without PTSD (Savarese et al., 2001). Krause et al. (2006) suggest that hyper arousal symptoms may result in someone being in a constant state of alert. Taft et al. (2007) suggest that veterans with PTSD, specifically those that have seen combat, are more likely to perceive threat in their environment even in the absence of a realistic threat. This heightened threat perception due to traumatic and possibly unresolved experiences may force the veteran into a state characterised by heightened arousal as well as cognitive biases such as "an inclination toward threat confirmation, increased vigilance in recognizing a threat" (p.270). Taft et al. (2007; 2015) further highlight that this may impede a veteran's ability to self-regulate anger or self-monitor their behaviour. Therefore, it is not surprising that hyper arousal symptoms, relative to other symptoms, are strongly associated with aggression, and thus correlated strongest with DVA in the military populations presented in this review.

Generalisability of Extracted Findings

Although the included studies suggest that DVA may be more prevalent amongst those with PTSD compared to those without PTSD, it is questioned whether the findings presented in the included studies are generalisable to general military populations. Particularly as it was not possible to quantify the relative risk (RR) of PTSD in respect of DVA due to a limited number of studies reporting the necessary prevalence data to perform these calculations. Attempts were made to obtain this data from the authors of the individual studies which proved futile (Appendix 5). In addition, the reported prevalence estimates and associated risk calculations varied widely between the studies, reflecting high levels of study heterogeneity. Due to limited data, pooled risk ratios could not be calculated for either type of

violence included in this review. Individual studies suggested an increased risk of partner violence perpetration among male and female military service personnel with PTSD.

Only two studies managed to recruit active personnel (Kwan et al., 2018; Teten et al., 2010) whereas the remaining studies focused on veteran samples. Although there are measures in place that can help active service members deal with combat related stress (Laurence & Matthews, 2012), the transition from different geographical locations during service can create barriers in access and quality of care (Institute of Medicine, 2013), which may explain the overrepresentation of veteran samples in this review. However, this makes it difficult to compare the prevalence of DVA between active service personnel and veterans to identify how active duty and current (rather than historical) war-zone stressors may influence the perpetration of DVA.

Moreover, most samples included in this review were help-seeking veterans associated with US Veterans Affairs. Findings based on samples of help-seeking veterans limit generalisability of findings as research has highlighted that help-seeking behaviours have not been typical for veteran populations (KCMHR, 2015; House of Commons, 2018; Palmer, 2012). Research suggests that deployed military personnel adopt a military culture which may lead to stoicism and resistance to seeking help (Iversen et al., 2005). Iversen et al. (2010) highlight that many UK armed forces personnel with mental health problems do not seek help and rely on non-medical sources such as chaplains, which was especially prevalent for those with alcohol problems and depression compared to those with PTSD. This is further underlined by the average time between military service discharges and assessment at a UK veteran trauma service being 12 years (Palmer, 2012). Stigma towards mental health problems has been evidenced in the general population when seeking help, during treatment and after discharge (Langston et al., 2007). As such, disparaging attitudes within society towards

mental illnesses makes admitting to a psychological problem much more stigmatising, resulting in higher engagement for medical compared to psychological treatment referrals amongst veterans (Britt, 2000). The Institute of Medicine (2013) highlight that 65% of military personnel fear that they would be perceived as 'weak' when seeking psychological treatment; 63% fearing that their superiors might treat them differently, and 59% fearing that others would have less confidence in them. Stigma has also been associated with mental health treatment for armed forces in Australia, US, New Zealand and Canada (Gould et al., 2010). Finally, as alluded to in the results section, there were a few studies that used the same samples, which again greatly limits the generalisability of findings to non-clinical samples as well as samples outside of the US.

Strengths and Limitations of the Current Review

The current review included a large number of quantitative studies that were deemed methodologically sound by two independent raters, thus reducing the probability of experimenter bias. A further strength of this review is the broad search terms which allowed for the inclusion of all military personnel past and present, a range of violent behaviours, all war eras and covered an extensive time frame of publication.

It is possible that the quality of the synthesised findings presented in the review is impacted by the different conceptualisations of DVA as well as PTSD among the samples. Concurrent with Trevillion et al.'s (2015) review, there was discrepancy in the way the different articles measured PTSD among their samples. Although the different measurement tools used have been shown to have good reliability and validity (e.g., PCL tools; M-PTSD; CAPS), the difference in conceptualising PTSD by using a range of self-report measures, or in some cases a clinician-administered assessment, should be borne in mind when interpreting

and comparing the overall findings. Both the reviews by Trevillion et al. (2015) and Misca and Forgey (2017) highlight issues with the measurement of DVA. This was noted in the current review, as although many studies used the CTS or CTS-2, often only specific scales or certain items of these scales were used. Research has criticised the CTS as, for example, it does not measure violence in context (e.g., self-defence vs. instrumental violence). This is important as previous research, as well as studies included in this review (e.g., Dekel & Solomon, 2006; Dutra et al., 2012; Jordan et al., 1992; Teten et al., 2009), describe the often-mutual nature of IPV.

Furthermore, PEO criteria were designed to incorporate articles looking at the full range of DVA, whereas most studies in this review looked at physical violence towards partners. It is further likely that this underrepresents the breadth of violence that may be prevalent in these samples, limiting the understanding of IPV that occurs in veteran-partner dyads. All studies except for LaMotte et al. (2016) also used self-report measures of IPV, which was likely characterised by under-reporting by the participants, as already alluded to by some of the authors of the included studies.

Implications for Future Research and Practice

The current review highlighted a need for methodologically rigorous research in the UK. Most of the articles included were from the US apart from the studies using an Israeli sample, Burundi sample or a UK sample. As such, there is scope to examine the prevalence of DVA as well as the role of bidirectional violence amongst couples from UK military forces. Nonetheless, the findings presented above suggest an increasing awareness among practitioners in respect of the impact of PTSD on DVA perpetrators who have a military background.

Furthermore, it has become evident that research has mainly looked at the impact of PTSD on IPV rather than violence towards other members of the family. However, it has been suggested that violence in the family home will affect other members of the immediate family (e.g., Sherman et al., 2016) and therefore research and clinical practice should extend their assessment of victimisation towards the veterans' parents, siblings or children. This review also highlights a demand for additional research to assess prevalence rates and relative risk of sexual DVA perpetration by active as well as veteran military personnel with PTSD; only one study included in this review measured this type of violence. It is speculated that perhaps research has been lacking in both these areas due to the sensitive nature of the subject area as well as the issue of under-reporting one's own violence.

Finally, the presented findings focussed primarily on male veterans with only a few studies sampling a small proportion of female veterans. Efforts have been made to employ more women by the military (Balshem et al., 2011) and it is therefore plausible that this number will increase with time, potentially allowing for further DVA research with female military samples.

Conclusion

Domestic violence and abuse amongst military populations with PTSD remains an understudied area, particularly for the UK. The majority of research is based on clinical samples of veterans from the US limiting the generalisability of research findings to the general military population. It appears that partner violent veterans are overrepresented in the current evidence base. This is likely due to a fundamental sampling bias in research concerning military IPV with many studies using samples from the same sources.

Additionally, as highlighted by Jordan et al. (1992), not all veterans with PTSD engage in domestic violence. Although there seems to be a clear link between PTSD and IPV, research has not yet reached solid agreement as to what may exacerbate or mediate this relationship.

This review has highlighted various avenues for further research (e.g., the need for qualitative research in this area). As discussed, it is likely that research does not capture the true prevalence and breadth of DVA in military families due to the retrospective self-report of DVA, which currently restricts this research area. Research should endeavour to capture context specific DVA using laboratory paradigms such as that used by LaMotte et al. (2016). Research is also beginning to emphasise the prevalence of DVA amongst female military personnel and has started to unveil the complex concept of mutually violent veteran-partner couples (e.g., Misca & Forgey, 2017).

PTSD remains a debilitating illness that many military personnel suffer due to their military experiences. As highlighted in this review and mirrored by previous research, combat related experiences have the potential to greatly impact on the wellbeing of our service men and women, as well as that of their families. Once the mechanism that motivates DVA amongst veterans is better understood, research and practice can move towards informing prevention and management of PTSD symptoms in relation to domestic violence perpetration.

CHAPTER FIVE:

DISCUSSION

This thesis aimed to explore the role of PTSD in the perpetration of violence generally, and more specifically, whether PTSD increases the risk of domestic violence and abuse perpetrated by veterans and/or serving military personnel. It is of note that many individuals take positive experiences from their service in the military (House of Commons, 2018), however, the focus of this thesis was on armed forces personnel for whom their military experiences had ill-effects.

Summary of Findings

The introductory chapter gives an overview of PTSD and aetiological factors that possibly contribute to the development of PTSD after exposure to traumatic experiences. Findings for each of the subsequent chapters are summarised below.

Chapter Two

As highlighted in the introduction chapter, our understanding of the clinical presentation of PTSD has changed and with this change, efforts have been made to update assessment tools to reflect current diagnostic criteria. Initial psychometric validation of the Clinician-Administered PTSD Scale (CAPS-5) advocates for its use in the assessment of PTSD within military veteran populations, and two foreign language versions (German and Dutch) of the CAPS-5 also demonstrated good initial psychometric properties of the tool. Nonetheless, there are some noteworthy limitations of the current research available for the English version of the CAPS-5. Consultation is advised prior to diagnosing PTSD using the CAPS-5 due to the increased flexibility in assigning an overall PTSD severity score. Despite its widespread clinical use, the overall evidence base for the CAPS-5 is limited, particularly in

respect of civilian populations. Further research is needed to establish validity and reliability of the tool within different cultural groups and trauma backgrounds.

Chapter Three

This chapter focused on the reported association between violence perpetration and PTSD in an attempt to synthesise existing literature to determine to what extent individuals with PTSD are at greater risk of engaging in violence.

Published literature was systematically identified using predetermined inclusion and exclusion criteria and reported event rates of violence amongst those with PTSD compared to adults without PTSD were synthesised. Findings suggested that military populations reported increased rates of violence towards strangers compared to civilian populations (39% versus 30%). Although the number of papers for the civilian versus military subgroups were small during meta-analysis, pooled event rates from the primary studies indicated much higher rates of violence for both civilian and military PTSD samples than have been reported for single samples elsewhere (e.g., 2.8% per 1000 adults, Office for National Statistics, 2019). The included studies differed in their methodological quality as well as the tools used to assess for PTSD and violence, reflecting the heterogenous nature of PTSD samples in terms of their symptomatic presentation. Further research would be useful for other population groups such as: females versus males; those who abuse substances; and those who have suffered a traumatic brain injury (although mild traumatic brain injuries[5] have been reported at substantially lower rates in the UK compared to the US (Jones et al., 2014)). Due to the

[5] Mild traumatic brain injury includes symptoms like headaches and problems with memory and has been explored within military populations deployed to Iraq and Afghanistan due to the increased exposure to improvised explosive devices (IEDs) used by opposition forces (House of Commons, 2018)

overlap of these variables and the small number of primary papers in this chapter, such analysis would not have yielded meaningful comparisons in this research.

Chapter Four

As identified in chapter three, existing research suggests that military cohorts are at higher risk (compared to civilian populations) of engaging in violence towards a stranger. This is alarming, particularly as the rate of PTSD is higher in UK military populations compared to the general population (KMCHR, 2018). To expand on this, this chapter explored the level of violence risk posed by veterans and/or serving military personnel towards intimate partners and family members.

A substantial number of papers (n = 21) were included in the systematic literature review. However, due to the lack of prevalence rates reported within each of the studies, that is, the number of military personnel (current/past) with PTSD who engaged in DVA and those who did not, it was not possible to pool the results and comment further on the relative risk of PTSD on DVA perpetration for this specific population. Additionally, the current literature base in this subject area is predominantly related to US samples and intimate partner violence, painting an unclear picture of the extent of DVA within UK samples and military families beyond that of an intimate partner.

Theoretical and Practical Implications

As discussed in chapter one, clinical research suggests that there are particular markers or predisposed vulnerabilities that might indicate an increased risk of developing PTSD following exposure to a traumatic experience. Theoretically, this could assist in the identification of individuals at greater risk of developing PTSD when exposed to traumatic

experiences, such as can be expected when deployed during military services or individuals who respond to critical incidents. Although this would introduce bias and potential exclusion of individuals for roles in the military or emergency services (particularly as individuals with PTSD present as a heterogenous cohort), mental health services could be targeted towards 'at-risk' individuals to promote help-seeking behaviours and early identification of PTSD. This would be helpful given that the period of experiencing symptoms before seeking help (particularly in military samples) often spans across a number of years (House of Commons, 2018; Palmer, 2012). Le-Niculescu et al. (2019) were able to use changes in blood gene expressions in a cohort of psychiatric patients to predict heightened states of stress, i.e., suicidal ideation. Indeed, the idea of screening for potential PTSD cases does not seem as unrealistic as it once might have; a recent study by Dean et al. (2019) reported on the development of an artificial intelligence (AI) tool that was able to distinguish US veterans with a confirmed diagnosis of PTSD from those without PTSD by analysing blood samples for distinct biomarkers with 81% accuracy. The authors identified limitations with their sample having used strict inclusion and exclusion criteria and suggest further validation of the AI tool within other PTSD samples. However, this is a promising advancement in the identification of PTSD cases beyond self-reported symptoms and/or clinician assessed PTSD.

Throughout the chapters, it was apparent that research into PTSD, particularly research related to military populations, comes predominantly from the US. Additionally, and as reported in chapter one, PTSD rates in military samples are lower for the UK (6.2%; Stevelink et al., 2018) than the US (13.8% Afghanistan/Iraq era, Kang et al., 2003; 29.6% - 30.9% Vietnam era, Kulka et al., 1990). This is interesting given that both UK and US military personnel have been deployed to most recent military conflicts such as those seen in Iraq and Afghanistan. Hunt et al. (2014) suggested that this may be related to demographic

differences between UK and US military samples such as: average deployment lengths (6 months for UK soldiers versus 1 year for US soldiers); age (US forces tend to be younger); and the percentage of reservists (a higher number for US forces). As previously mentioned, the generalisability of the rate of violence found for PTSD samples in chapter three is limited and future research may want to consider examining this rate within military PTSD samples on the basis of differences which exist between Armed Forces from different nations.

Nonetheless, the findings collated in this thesis highlight the need for greater support for individuals leaving the military service, particularly to reduce the time between service discharge and seeking help for mental health difficulties. On the 1st of November 2019, the Ministry of Defence announced the so-called "Defence Transition Service", which aims to provide support to military personnel and their families when transitioning from military to civilian life. The question arises as to why such provisions were not put in place much sooner, for example, following the end of the Iraq/Afghanistan Wars. Indeed, Canada sets a paragon in supporting military personnel, having offered a Veterans Transition Program (VTP) since 1997, providing counselling and support to veterans who are in transition from military to civilian life. An evaluation of VTP's delivered between October 2012 and August 2018 reported it to be effective in decreasing symptoms of PTSD, depression, suicidal ideation, and alcohol abuse whilst increasing self-esteem, sleep quality and life satisfaction (Thorne & Cox, 2018). In addition to the Defence Transition Service recently introduced in the UK, military education might be helpful throughout military service to raise awareness of possible PTSD symptoms following deployment and challenging the self-stigma experienced by veterans (e.g., Mittal et al., 2013). Indeed, Combat Stress UK has made efforts to interview veterans and family members for their Centenary Project (Combat Stress 100 film; Combat Stress, 2019) to share the experiences of combat, PTSD and therapy of UK veterans in an attempt to

promote open conversation about life after military service and the difficulties this transition might bring. Efforts to raise such awareness appear to have been rather limited from the UK Government and predominantly led by mental health charities until 2016 when NHS England developed and launched the Veterans' Mental Health Transition, Intervention and Liaison Service (TILS) (NHS England, 2017). Following this, NHS England further launched the Veterans' Mental Health Complex Treatment Service (VMH CTS), a service for ex-Armed Forces personnel, who have complex mental health needs attributable to their military service (NHS England, 2018). Furthermore, NHS England commissioned the Veterans' Mental Health High Intensity Service (HIS) in January 2020. The proposed model of the HIS service is currently being tested, with the final service model planned to launch in 2022 (NHS, 2020). The HIS will provide liaison, advice and support to health and care services, which are perhaps more local to a veteran's own home when needing urgent care and treatment, or are able to provide specialist services such as inpatient placements, if required (NHS, 2020).

Strengths and Limitations of the Thesis

This thesis contributes to the literature base in respect of PTSD and its association with violence; summarising the existing literature and highlighting issues that limit the generalisability of already published findings. Following review of the literature in the individual chapters, avenues for future research have been identified.

Limitations of the individual chapters have been previously described. However, looking at the thesis as a whole, although the systematic searches used for chapters three and four of this thesis were based on the legal definition of DVA rather than IPV, it did not yield more conclusive findings in respect of violence experienced within the wider family. This is due to the literature base having focused on intimate partner violence more so than violence

toward other members of the family. Therefore, the current findings are representative of violence towards intimate partners but perhaps less so when the definition of DVA is applied. This will need to be addressed in future research particularly as the Crime Survey for England and Wales highlighted that of all crime recorded by the police between July 2018 and June 2019, 14% were related to DVA (Office for National Statistics, 2019).

Furthermore, research is currently fraught by problematic reporting or capturing of 'true' PTSD and violence data as most measures used, in particular measures of DVA, are based on self-report, and in seldom cases, on partner reports. This has been noted as a limitation within academic research as well as by policy makers, suggesting that the true rate of PTSD, particularly within the Armed Forces, may be higher than reported and is currently confined to those that seek help (House of Commons, 2018).

There are further facets within military populations, such as reservist subgroups, for whom probable PTSD rates have been estimated to be higher than for the rest of the Armed Forces (Griffith, 2010; House of Commons, 2018), which have not been explored within this thesis. Similarly, and as mentioned in chapter four, information in this thesis relating to sexual DVA was sparse and property violence (e.g., Easteal et al., 2018; Murphy-Edwards & Van Heugten, 2015), another form of DVA, also remains unexplored. In chapter three, the definition of violence was limited to acts such as homicide, rape and assault, mirroring existing literature. This approach was adopted to try and achieve consistency in the working definition of violence within this chapter. However, it is acknowledged that this is a constrained definition of violence and may not reflect the complexity of aggression exhibited towards strangers.

Future Research

Suggestions for further research have been identified within the individual chapters. In addition to this, however, and as described in chapter one, diagnostic criteria of PTSD have been adjusted in respect of developmental sensitivity to allow for PTSD assessment in children. This begs the question of how geriatric populations encompass the current PTSD diagnostic criteria. Friedman et al. (2010) emphasise that older adults may be impacted by experiences encountered when they were younger as well as difficulties experienced in their daily routine, such as negative perceptions of personal health, primary care and loss of independence. In addition, Duax et al. (2013) suggest that veterans who suffer from PTSD have an increased risk of developing dementia; a finding which favours future research of PTSD expression across the ages, and advocates for age specific information to be incorporated into the treatment of PTSD.

Furthermore, and as previously mentioned, research has highlighted barriers to seeking help for mental health difficulties, and to our knowledge, there is only one published article (Teten Tharp et al., 2016) which recounts the experiences of barriers to seeking help for the perpetration of DVA amongst military veterans. The study by Teten Tharp et al. (2016) found that veterans reported pride or embarrassment, denial of their violence perpetration, as well as fear that their partner would not participate in treatment as being barriers for seeking help for their DVA. Williamson (2012) explored help-seeking barriers from the perspective of the military personnel's partners; the participants reported that the biggest barrier to accessing military welfare services was the perceived impact on the career of their partner. Participants highlighted that there was a stigma attached to families who used such services, which would have an impact on their partners' military careers. In order to understand the support that veterans with PTSD and a history of DVA require, it would be

important to understand their experiences and the impact these have had on their psychological/behavioural functioning. As such, future research might benefit from the use of a qualitative approach (e.g., Interpretative Phenomological Analysis) to explore in detail how participants make sense of their personal and social experiences (Smith & Osborn, 2008); there is currently no published study that explores the lived experiences of veterans suffering from PTSD who have engaged in domestic violence and abuse. Furthermore, as identified during data collection for chapter four of this thesis, there is a lack of qualitative research in this subject area. A qualitative approach would allow individuals to express their experiences and underlying opinions, and a person-centred approach might shed light on military veterans' interpretations of their violence perpetration, to inform treatment needs, highlighting areas for intervention and prevention of domestic violence and abuse.

Overall Conclusions

This thesis highlighted the need to support individuals with PTSD who engage in aggressive or violent behaviour, recognising the vulnerability of these individuals. Although research and clinical practice has focused on developing treatment of PTSD, advances are being made in respect of early identification of PTSD which may promote help-seeking behaviour to reduce the consequences of the disorder on the sufferer and their wider social network. A large proportion of current research of PTSD comes from clinical samples and in light of the stigma that has burdened help-seeking behaviour especially for military personnel, gratitude must be expressed to those that have participated in research, and more recently in the UK, have promoted dialogue about their experiences in an attempt to change the narrative of mental-ill health following exposure to trauma. As previously described, the year 2016 represents a significant shift in the level of support offered to Armed Services personnel, past

and present. Since then, continual progress has been made by the UK Government such as the establishment of the Office for Veterans' Affairs in October 2019 (HM Government, 2020); greater collaboration with public sector services (e.g., Department of Education or NHS England) and greater financial investment in the commissioning and development of bespoke services for veterans and their families (HM Government, 2020). The UK Government Action Plan (HM Government, 2020) with a scope to 2028 is promising for the future of veteran mental health services, to support those who served Queen and Country (as well as their families and social networks) with a successful reintegration into civilian life following military service discharge.

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Appendices

Appendix 1

Search Syntax

Ovid PSYCINFO SEARCH 1806 - 1966 and 1967 -2017

1. ("Post-traumatic Stress Disorder" or "Shell Shock" or "PTSD" or "posttraumatic stress disorder").mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]
2. ((domestic or spous* or partner* or wife* or wives or child or children or family or families or domicil*) adj3 (violen* or beat* or abus* or assault* or batter* or aggress*)).mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]
3. exp posttraumatic stress disorder/
4. domestic violence/
5. exp partner abuse/
6. ipv.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]
7. ("armed force*" or "military" or "army" or armies or "service personnel" or "soldier*" or "combat" or "air force*" or RAF or navy or naval or veteran* or "war zone" or "war-zone*").mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]
8. exp military personnel/
9. 1 or 3
10. 2 or 4 or 5 or 6
11. 7 or 8
12. 9 and 10 and 11

WEB OF SCIENCE 1900-2017

Web of Science Core Collection: Citation Indexes

- [x] Science Citation Index Expanded (SCI-EXPANDED) --1900-present
- [x] Social Sciences Citation Index (SSCI) --1900-present
- [x] Arts & Humanities Citation Index (A&HCI) --1975-present
- [x] Conference Proceedings Citation Index- Science (CPCI-S) --1990-present
- [x] Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH) --1990-present
- [ ] Book Citation Index– Science (BKCI-S) --2010-present
- [ ] Book Citation Index– Social Sciences & Humanities (BKCI-SSH) --2010-present
- [x] Emerging Sources Citation Index (ESCI) --2015-present

#7	#6 AND #3 AND #1 *DocType=All document types; Language=All languages;*
#6	#5 OR #2 *DocType=All document types; Language=All languages;*
#5	**TOPIC:** (ipv) *DocType=All document types; Language=All languages;*
#4	#3 AND #2 AND #1 *DocType=All document types; Language=All languages;*
#3	TS=("*armed force*" OR "military" OR "army" OR armies or "service personnel" OR "soldier*" OR "combat" or "air force*" or RAF or navy or naval or veteran* or "war zone" or "war-zone*") *DocType=All document types; Language=All languages;*
#2	TS=((domestic OR spous* OR partner* OR wife* or wives OR child or children OR family OR families OR domicil*) near/3 (violen* OR beat* OR abus* OR assault* OR aggress* OR batter*)) *DocType=All document types; Language=All languages;*
#1	**TOPIC:** ("Post-traumatic Stress Disorder" OR "Shell Shock" OR "PTSD" OR "posttraumatic stress disorder") *DocType=All document types; Language=All languages;*

Proquest PILOTS 1871-2017

ab("Post-traumatic Stress Disorder" OR "Shell Shock" OR "PTSD" OR "posttraumatic stress disorder") AND ab("armed force*" OR "ex armed force*" OR "military" OR "army" OR armies OR "service personnel" OR "soldier*" OR "combat" OR "air force*" OR RAF OR navy OR naval OR veteran* OR "war zone" OR "war-zone*") AND (ab((domestic OR spous* OR partner* OR wife* OR wives OR child OR children OR family OR families OR domicil*) NEAR/3 (violen* OR beat* OR abus* OR assault*)) OR ab(ipv))

Ovid MEDLINE(R) SEARCH 1946-2017

1. ("Post-traumatic Stress Disorder" or "Shell Shock" or "PTSD" or "posttraumatic stress disorder").mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]
2. ((domestic or spous* or partner* or wife* or wives or child or children or family or families or domicil*) adj3 (violen* or beat* or abus* or assault* or batter* or aggress*)).mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]
3. exp posttraumatic stress disorder/
4. domestic violence/
5. exp partner abuse/
6. ipv.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]
7. ("armed force*" or "military" or "army" or armies or "service personnel" or "soldier*" or "combat" or "air force*" or RAF or navy or naval or veteran* or "war zone" or "war-zone*").mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]

8. exp military personnel/
9. 1 or 3
10. 2 or 4 or 5 or 6
11. 7 or 8
12. 9 and 10 and 11

Ovid EMBASE SEARCH 1974-2017

1. ("Post-traumatic Stress Disorder" or "Shell Shock" or "PTSD" or "posttraumatic stress disorder").mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]
2. ((domestic or spous* or partner* or wife* or wives or child or children or family or families or domicil*) adj3 (violen* or beat* or abus* or assault* or batter* or aggress*)).mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]
3. exp posttraumatic stress disorder/
4. domestic violence/
5. exp partner abuse/
6. ipv.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]
7. ("armed force*" or "military" or "army" or armies or "service personnel" or "soldier*" or "combat" or "air force*" or RAF or navy or naval or veteran* or "war zone" or "war-zone*").mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, tc, id, tm]
8. exp military personnel/
9. 1 or 3
10. 2 or 4 or 5 or 6
11. 7 or 8
12. 9 and 10 and 11

Appendix 2

Table 10

Exclusion and inclusion criteria based on PEO framework

Population: Military	
Inclusion criteria	Exclusion criteria
• Male • Female • Military veterans who have served under any recognised government worldwide and any military service, aged 18 years and older • Active service personnel who have served under any recognised government worldwide and any military service, aged 18 years and older • All disciplines and ranks of military (communication staff, medical staff etc.)	• Reservists without any active deployment • Militia groups; secret services • Police forces
Exposure: PTSD	
Inclusion criteria	Exclusion criteria
• Combat related PTSD • non-combat but service related PTSD • clinical diagnosis of PTSD • symptoms of PTSD even if these do not meet threshold for PTSD diagnosis	• Non-military service related trauma (e.g. childhood trauma)
Outcome: Domestic violence	
Inclusion criteria	Exclusion criteria
• Violent behaviour observed in active service personnel or veterans • Violence that occurred in any context other than in the service environment; • Any incident of controlling, coercive, aggressive, threatening behaviour, violence or abuse between those who are, or have been intimate partners, as well as family members. The abuse can encompass, but is not limited to psychological, physical, sexual, financial, emotional abuse.	• Violence directed towards the self • Behaviour that does not have the potential to cause fear of harm or actual harm in others • Violence that occurred in the active duty environment • Stranger violence • Violence towards acquaintances, peers or friends • Property violence.
Research design	
Inclusion criteria	Exclusion criteria
• Any published empirical study (including cohort studies, case-control, cross-sectional, case studies, observational studies) • Papers published in the English language	• Opinion papers; Commentaries • Unpublished theses • Qualitative research • Editorials • Papers published in any language other than English • Literature reviews • Meta-analyses

	• Book chapters that do not contain empirical studies • Theoretical or narrative reviews

Appendix 3

Quality assessment tools

Table 11

AXIS tool for assessing the quality of cross-sectional studies (Downes et al., 2016)

	Article:	Yes (=2)	Partial (=1)	No (=0)	Unclear	Comment
	Introduction					
1.	Were the aims/objectives of the study clear?					
	Methods					
2.	Was the study design appropriate for the stated aim(s)?					
3.	Was the sample size justified?					
4.	Was the sample clearly defined? (Is it clear who the research was about?)					
5.	Was the sample frame taken from an appropriate population base so that it closely represented the target population under investigation?					
6.	Was the selection process likely to select subjects/participants that were representative of the target population under investigation?					

7.	Were measures undertaken to address and categorise non-responders?					
8.	Were the risk factor and outcome variables measured appropriate to the aims of the study?					
9.	Were the risk factor and outcome variables measured correctly using instruments/measurements that had been trialled, piloted or published previously?					
10.	Is it clear what was used to determined statistical significance and/or precision estimates? (eg, p values, CIs)					
11.	Were the methods (including statistical methods) sufficiently described to enable them to be repeated?					
12	Was ethical approval or consent of participants attained?					
	Results					
13.	Were the basic data adequately described?					
~~14.~~	~~Does the response rate raise concerns about non-response bias?~~					

15.	If appropriate, was information about non-responders described?					
16.	Were the results internally consistent?					
17.	Were the results for the analyses described in the methods, presented?					
	Discussion					
18.	Were the authors' discussions and conclusions justified by the results?					
19.	Were the limitations of the study discussed?					
	Other					
	Were there any funding sources or conflicts of interest that may affect the authors' interpretation of the results?					
Total: / 36 (%)						

Quality assessment tool for quantities studies (EPHPP)

Article:

COMPONENT RATINGS

A) SELECTION BIAS

(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?

1 Very Likely
2 Somewhat likely
3 Not likely
4 Can't tell

Comments:

(Q2) What percentage of selected individuals agreed to participate?

1 80-100 % agreement
2 60-79% agreement
3 less than 60% agreement
4 Not applicable
5 Can't tell

Comments: It has not been described how many participants contacted the researchers to take part in the study and whether all were eligible for inclusion.

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

B) STUDY DESIGN

Indicate the study design

1 Randomised controlled trial
2 Controlled clinical trial
3 Cohort analytical (two group pre + post)
4 Case-control
5 Cohort (one group pre + post (before and after))
6 Interrupted time series
7 Other specify _____
8 Can't tell

Was the study described as randomized? If NO, go to component C.

NO YES

If Yes, was the method of randomization described? (see dictionary)

NO YES

If Yes, was the method appropriate? (see dictionary)
NO YES

Comments:

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

C) Confounders

(Q1) Were there important differences between groups prior to the intervention?

1 Yes
2 No
3 Can't tell

The following are examples of confounders:
1 Race
2 Sex
3 Marital status/family
4 Age
5 SES (income or class)
6 Education
7 Health status
8 Pre-intervention score on outcome measure

Comments:

(Q2) If yes, indicate the percentage of relevant confounders that were controlled (either in the design (e.g. stratification, matching) or analysis)?

1. 80-100% (most)
2. 60-70% (some)
3. Less than 60% (few or none)
4. Can't tell

Comments:

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3 X

D) Blinding

(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?

1 Yes
2 No
3 Can't tell

Comments:

(Q2) Were the study participants aware of the research question?
1 Yes
2 No
3 Can't tell

Comments:

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

E) DATA COLLECTION METHODS

(Q1) Were data collection tools shown to be valid?
1 Yes
2 No
3 Can't tell

Comments:

(Q2) Were data collection tools shown to be reliable?
1 Yes
2 No
3 Can't tell

Comments:

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

F) WITHDRAWALS AND DROP-OUTS

(Q1) Were withdrawals and drop-outs reported in terms of numbers and/or reasons per group?
1 Yes
2 No
3 Can't tell
4 Not Applicable (i.e. one time surveys or interviews)

Comments:

(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest).

1. 80 -100%
2. 60 - 79%
3. less than 60%
4. Can't tell
5. Not Applicable (i.e. Retrospective case-control)

Comments:

RATE THIS SECTION	STRONG	MODERATE	WEAK	
See dictionary	1	2	3	Not applicable

G) INTERVENTION INTEGRITY

(Q1) What percentage of participants received the allocated intervention or exposure of interest?

1. 80 –100%
2. 60 - 79%
3. less than 60%
4. Can't tell

Comments:

(Q2) Was the consistency of the intervention measured?

1 Yes
2 No
3 Can't tell

Comments:

(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?

4. Yes
5. No
6 Can't tell

Comments: Not described

F) ANALYSES

(Q1) Indicate the unit of allocation (circle one)
community organization/institution practice/office individual

(Q2) Indicate the unit of analysis (circle one)
community organization/institution practice/office individual

(Q3) Are the statistical methods appropriate for the study design?

1 Yes
2 No

3 Can't tell

(Q4) Is the analysis performed by intervention allocation status (i.e. intention to treat) rather than the actual intervention received?

1 Yes
2 No
3 Can't tell

GLOBAL RATING
COMPONENT RATINGS
Please transcribe the information from the grey boxes on pages 1-4 onto this page. See dictionary on how to rate this section.

A	SELECTION BIAS	STRONG	MODERATE	WEAK	
		1	2	3	
B	STUDY DESIGN	STRONG	MODERATE	WEAK	
		1	2	3	
C	CONFOUNDERS	STRONG	MODERATE	WEAK	
		1	2	3	
D	BLINDING	STRONG	MODERATE	WEAK	
		1	2	3	
E	DATA COLLECTION METHOD	STRONG	MODERATE	WEAK	
		1	2	3	
F	WITHDRAWALS AND DROPOUTS	STRONG	MODERATE	WEAK	
		1	2	3	Not applicable

GLOBAL RATING FOR THIS PAPER (circle one):
1 STRONG (no WEAK ratings)
2 MODERATE (one WEAK rating)
3 WEAK (two or more WEAK ratings)

With both reviewers discussing the ratings:
Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?
No Yes

If yes, indicate the reason for the discrepancy

1 Oversight
2 Differences in interpretation of criteria
3 Differences in interpretation of study

Final decision of both reviewers (circle one): **1 STRONG**
2 MODERATE
3 WEAK

Appendix 4

Data extraction form adapted from "Data collection form for intervention reviews for RCTs and non-RCTs - Cochrane Collaboration"

General Information

Title	
Authors	
Publication type	
Publication date	
Country of origin	

Characteristics of included studies

Methods

Aim/objective of study *(e.g. efficacy, equivalence, pragmatic)*	
Hypothesis	
Design *(e.g. parallel, crossover, non-RCT)*	
Was IPV/DV perpetration a primary outcome of the study?	

Participants

Sample size	
Type of sample (e.g. clinical population, students, general population)	

Inclusion criteria	
Exclusion criteria	
Method of recruitment of participants *(e.g. phone, mail, clinic patients)*	
Mean Age	
Sex	
Race/Ethnicity	
Marital status	
Primary diagnosis of PTSD or measure of combat-related PTSD	
Co-morbidities	
War era	
Status of military service (e.g. active, reserve, veteran)	
Military branch of service	

Data collection & Outcomes

Method of data collection	

Measures used to assess IPV/DV	
Collateral report of IPV perpetration	
Type of violence assessed	
Time points measured *(specify whether from start or end of intervention if applicable)*	
Length of follow-up if applicable	
Withdrawals and exclusions	

Data and analysis

Statistical methods used	
Has the study identified any confounding variables or factors that may affect the results of the study?	
No. of missing participants' data	

Results and conclusions

Main findings (Prevalence of IPV/DV?) (Has the study identified mediating factors for the relationship between PTSD and DV?)	
Direction of results if applicable	
Key conclusions of authors	

Appendix 5

Email correspondence with authors requesting further information

Tharp, Andra <[redacted]>

Thu 10/10/2019, 17:22

[redacted]

Apologies for the delay, this took a bit of digging. I no longer have access to the data from this study, but in pre-publication versions of the manuscript, I found the following:

Chi-square tests indicated that pattern of violence was not associated with veteran diagnosis of PTSD, $\chi^2 = 0.44$, $p = .80$, or ethnicity, $\chi^2 = 5.52$, $p = .06$. Instead, 56% (non-violent) to 65% (mutually violent) of the veterans in each violence pattern had a diagnosis of PTSD.

I'm not sure that this specifically answers your question but wanted to pass along in case it is useful.

V/r,
Andra

Fri 20/09/2019, 17:36

[redacted] (Psychology)

Dear Andra,

I am emailing regarding your paper "Intimate Partner Violence Between Male Iraq and Afghanistan Veterans and Their Female Partners Who Seek Couples Therapy".

I am currently carrying out a systematic review on research which considers the relationship between PTSD and domestic violence and abuse (DVA) at the University of Birmingham, UK.

I can see that in your sample for this paper, 46 veterans have PTSD. I would like to know how many with PTSD indicated IPV (i.e. verbal and physical aggression) and how many did not, as well as how many veterans without PTSD engaged in IPV and how many did not. Would you be able to provide me with this information, please?

The reason I am collecting this information is to calculate relative risk between those who have engaged in DVA and have PTSD and those who do not have PTSD.

I look forward to hearing from you,

Best wishes,

Taft, Casey T [BHS]

|Fri 20/09/2019, 17:51
Hi Nicola,

I will see what we can do next week. We are in grant mode today with a tight deadline. I will be back in touch soon.

Kind regards,

Casey

Casey Taft, Ph.D.
National Center for PTSD, Boston
VA Boston Healthcare System (116B-5)
150 South Huntington Avenue
Boston, MA 02130
Professor, Boston University School of Medicine

Fri 20/09/2019, 16:27

(Psychology)
Dear Casey,

Apologies for emailing again, it appears that quite a number of your papers are included in my research. I am emailing regarding your paper "Social Information Processing in Anger Expression and Partner Violence in Returning U.S. Veterans".

As mentioned in earlier emails, I am currently carrying out a systematic review on research which considers the relationship between PTSD and domestic violence and abuse (DVA) at the University of Birmingham, UK.

I have calculated the percentages of PTSD break down and concluded that 42 individuals of your sample met diagnostic threshold for PTSD and 50 did not. I would like to know how many with PTSD indicated IPV and how many did not, as

well as how many veterans without PTSD engaged in IPV and how many did not. Would you be able to provide me with this information please?

The reason I am collecting this information is to calculate relative risk between those who have engaged in DVA and have PTSD and those who do not have PTSD.

I look forward to hearing from you,

Best wishes,