UNIVERSITY OF ABERDEEN

SCHOOL OF EDUCATION

# MEd/MSc Masters Project/WBP/Dissertation

# FINAL PROJECT SUBMISSION FEEDBACK SHEET

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- Evaluate how findings and/or enhanced practice benefit your students, colleagues, the wider academic community, or other stakeholders

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# *Doing No Harm in Widening the Window.*

# *A systematic review of the efficacy of MBIs for PTSD examining what works, why, and what may need to be changed.*

**Submitted by Jacqueline Moore (17/08/2023)**

***A dissertation presented in partial fulfilment of the requirements for the degree of MSc Studies in Mindfulness at the School of Education, University of Aberdeen.***

***I declare that this dissertation has been composed by myself, that it has not been accepted in any previous application for a degree, that the work of which it is a record has been done by myself, all quotations have been distinguished appropriately and the source of information specifically acknowledged.***

**Signature:**  **Date: 17th August 2023**

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## Abstract

Post Traumatic Stress Disorder (PTSD) is a global health issue and conventional treatments have limited efficacy. Dropout and non-response rates are high, possibly due to adverse effects (AEs). Due to their non-exposure-based approaches, interest in the use of Mindfulness-Based Interventions (MBIs) as adjunctive treatments has increased. This study examined the efficacy of MBIs in treating PTSD exploring several key aspects.

## Method

In a Systematic Review (SR) using mixed methods, the quantitative effects of MBIs were examined for their efficacy on PTSD outcomes. Evidence of causative links between facets of mindfulness and changes in PTSD symptom clusters, and the underlying neurophysiological mechanisms involved, were also explored. Finally, given the extent of nervous system impairment in those with PTSD, the evidence of the need to adapt MBIs for this population was examined.

## Discussion

Quantitative data indicates mostly small to moderate effect sizes for MBIs. Empirical evidence linking facets of mindfulness to reductions in PTSD symptom clusters is weak. Findings on the neural mechanisms involved show promise, especially around interoceptive function. MBIs are generally tolerated by participants but dropout rates are high, and the experience of AEs is not uncommon.

## Conclusion

The efficacy of MBIs for PTSD has not been rigorously tested. Further longitudinal randomised control trials (RCTs) are needed comparing MBIs with empirically based, specific active controls. Evidence on the correlation between facets of mindfulness and PTSD symptoms is required to fully understand the unique benefits of MBIs for this disorder. Along with brain imaging, qualitative studies are essential to provide insight into the experiential effects of MBIs not captured by quantitative outcomes. Finally, the modification of MBIs is recommended to prioritise the stabilisation of the autonomic nervous system (ANS), ensuring safety by containing an individual's window of tolerance before widening it.

**Keywords**: Mindfulness-Based Interventions (MBIs), Post Traumatic Stress Disorder (PTSD), Autonomic Nervous System (ANS), Mindfulness Meditation (MM), embodiment, interoception.

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To my classmates, who made me feel like I am where I belong!

This dissertation is dedicated to all those who suffer as a result of overwhelming stress or trauma. May you find peace, grace and hope for better days ahead.

*Per aspera ad astra*

# 1. CHAPTER 1: INTRODUCTION

This introductory chapter provides the aim and rationale for this dissertation.

## 1.1 Aim of Research

The purpose of this dissertation is to conduct a Systematic Review (SR) of research on Mindfulness-Based Interventions (MBIs) for Post Traumatic Stress Disorder (PTSD). I aim to assess the quantitative impact of MBIs on PTSD, examine the components of mindfulness that underpin it, explore the neurobiological mechanisms involved, and assess the evidence supporting them. Additionally, I will examine if there is evidence for MBIs to be adapted for the specific needs of those with PTSD.

## 1.2 Rationale

Apparently, a friend once told trauma researcher Bessel Van der Kolk that all research is 'me-search' and in my case, there is some truth in that! My interest in the subject matter of this dissertation was sparked several years ago when a period of successive stressful and traumatic events led to a diagnosis of Adjustment Disorder (AD). AD is a stress-related disorder that falls under the same diagnostic category as other stress response disorders, including PTSD (APA, 2013; WHO 2018). Mindfulness Meditation (MM) played a large role in my recovery, however, I found certain mindfulness practices very difficult due to my stressed physiological state. Fortunately, having had experience with mindfulness, I was able to adapt the practices as needed. Had I not been able to do that, I would most likely have abandoned them due to the fear of increased distress. The experience left me wondering whether certain mindfulness practices could, and should, be tailored for those in similar clinical and subclinical situations. With an increasing number of individuals with stress- and trauma-related disorders (Burback et al 2023), it is not unreasonable to assume that most, if not all, meditation classes have at least one person presenting with that physiology. The experience of adverse effects during MBIs is not uncommon and research has indicated that standard MBIs may not be suitable for those with PTSD (Dobkin et al., 2012; Strauss et al., 2014; Van Dam et al., 2018). I wanted to

explore what standard MBIs do for trauma, specifically whether they help or harm and if so, how.

After doing some research I discovered that a chronic maladaptive functioning of the autonomic nervous system (ANS) is a core feature of many stress- and trauma-related disorders (Alvares et al., 2016; Siepmann et al., 2020; Vinkers et al, 2021). Thus, resetting normal ANS function is essential for recovery (Forstenpointner et al., 2022). The ANS plays a vital role in the body's stress response, using its two branches, the sympathetic and parasympathetic, to mobilise the fight/flight/freeze response when in danger. Once the threat has passed, the ANS returns the body to its appropriate homeostatic points (Jänig, 2022). This is the normal adaptive "normofunctional" state (Forstenpointner et al., 2022). However, if an experience is too overwhelming or becomes chronic, the brain can get stuck in a state of continuous stress mobilisation and is unable to switch itself off, manifesting in hyper- or hypo-arousal reactions or flipping between the two (Yang et al., 2005; Siepmann et al., 2020; Punkanen and Buckley, 2021; Lee et al., 2022). This can lead to a state of chronic dysregulation of the ANS, causing a wide range of symptoms (Sherin and Nemeroff, 2011 Barizien et al., 2021; Forstenpointner et al., 2022). This is when PTSD and other stress- and trauma-related disorders develop (Jänig, 2006, 2022; Alvares et al., 2016).

Fascinated, I had planned to write my dissertation on the efficacy of MBIs on an already dysregulated ANS in individuals with stress- and trauma-related disorders. However, after reviewing the literature, I realised that my focus was too broad. For reasons to be discussed later, I discovered that of these disorders, PTSD has received the most funding and is the most researched (Thomaes et al., 2014; Kaiser et al., 2018). Therefore, I decided to focus my attention on PTSD. Given that there is significant overlap between the etiologic underpinnings and symptomology of PTSD and other similar disorders (Fitzgerald et al., 2018; Kimbayia et al., 2022), I was of the view that examining the research on MBIs with PTSD might be the most insightful in terms of treating the underlying dysfunction present.

PTSD is a complex, heterogeneous disorder and is difficult to treat (Burback et al., 2023). Estimates of the lifetime prevalence vary, but globally it ranges between 1% and 9% (Joshi et al., 2020). In the US, it is estimated at 8% of the general population, with higher rates for women (up to 50% higher) and those exposed to multiple traumatic events (Akiki et al., 2017;

Joshi et al., 2020; Harnett et al., 2020). Moreover, having PTSD increases the likelihood of being diagnosed with other illnesses (Schwartz and Maiberger, 2018; Mureșanu et al., 2022). Aside from the personal cost, a recent study found that the economic burden of PTSD in the US was estimated to be $232.2 billion in 2018, exceeding the costs of anxiety, and depression, making it a significant public health issue (Davis et al., 2022).

With all of the above in mind, I chose to look at the evidenced-based research on MBIs in treating PTSD with the overarching long-term goal of potentially using the results to inform the feasibility of tailoring an MBI specifically for those with stress- and trauma-related disorders.

# 2. CHAPTER 2: LITERATURE REVIEW

This literature review provides a comprehensive overview of PTSD, which is crucial for understanding the potential of MBIs in its treatment. Included is the clinical definition, background context, and contentious issues with that definition. It presents the clinical characteristics and an overview of the key theories which influenced the main treatment approaches. This chapter also discusses the neurobiological basis of PTSD, the mechanisms of mindfulness, and the hypothesized relationship between the two.

## 2.1 Muddy Waters: from Mesopotamia to PTSD

### 2.1.1 Background

In this dissertation, trauma refers to psychological trauma, as opposed to the blunt-force bodily trauma of physical medicine. It refers to the emotional response to extreme stress that overwhelms a person's ability to cope (APA, 2013). While most people recover, for some the negative impact, if severe enough, may turn into a clinical disorder (Burback et al., 2023). This dissertation focuses solely on PTSD, not Complex Trauma (C-PTSD), which is a related but different disorder. C-PTSD, also a controversial diagnosis, tends to arise from more chronic traumatic experiences and can have different symptoms and neural biomarkers (Karatzias et al., 2017; Brewin, 2020).

### 2.1.2 Current Position of PTSD

Mental health disorders are categorised by the American Psychiatrists Association (APA) and the World Health Organisation (WHO). The Diagnostic and Statistical Manual of Mental Disorders (DSM) is produced by the APA and is used mainly in the US. WHO produces the International Classification of Diseases (ICD), which is used by all 194 WHO member states, including the UK and Europe (WHO, 2023). PTSD is currently categorised in both the DSM and the ICD as a trauma- and stress-related disorder (APA, 2013; WHO, 2022).

According to the DSM-V, the most recent edition, the diagnostic criteria for PTSD include the following:

> ***exposure to a traumatic event (Criterion A), and twenty symptoms in four symptom clusters consisting of (1) intrusions, (2) avoidance, (3) negative alterations in cognitions and mood, and (4) hyperarousal and reactivity*** (APA, 2013).

To meet the diagnosis, an adult must have all of the following for at least 1 month:

> ***at least one intrusion (re-experiencing) symptom, at least one avoidance symptom, at least two cognition and mood symptoms, and at least two arousal and reactivity symptoms*** (APA, 2013).

Similarly, in the ICD-11, PTSD includes six symptoms organized under three symptom clusters: (1) *re-experiencing of the traumatic event(s), (2) avoidance of traumatic reminders and (3) persistent sense of current threat.* A diagnosis requires exposure to an extreme stressor and the experience of at least one symptom from each cluster (WHO, 2022).

Apart from the specific symptom clusters, what differentiates PTSD from the other disorders in the category is "Criterion A", the requirement of exposure to a major traumatic stressor (Hyland et al., 2021; Muthu, 2021). The full definition and diagnostic criteria of PTSD is attached in **Appendix 2.**

### 2.1.3 A Controversial Diagnosis

The clinical diagnosis of PTSD is relatively new – it first appeared in the DSM in 1980. The classification of mental health disorders has always been contentious, but none more so than PTSD (Brewin, 2020; OH et al., 2020; Muthu, 2021). The definition has long been the subject of debate; despite successive revisions, controversy about its status as a legitimate diagnosis continues (Boals, 2018; Stein et al., 2014; Reed et al., 2015; Muthu, 2021; Kiyimba et al., 2022; Burback et al., 2023). Part of the contention is largely due to its military origins (Dean, 1997; Friedman et al., 2011; Morris, 2015). The documentation of symptoms experienced by soldiers, dating back to the ancient wars in Mesopotamia (1300-609BC), heavily influenced the first

editions of the DSM in 1952 and the ICD in 1948 (Abdul-Hamid & Hughes, 2014; Muthu, 2021; Kiyimba et al., 2022). Furthermore, the formal recognition of PTSD as a diagnosis in 1980 was due to the strong political lobbying of the Vietnam veterans' movement of the 1970s, rather than to any medical or scientific consensus (Baldwin et al., 2004; McHugh and Triesman, 2007; Boone, 2011; Muthu, 2021; Kiyimba et al., 2022).

Many have raised concerns about the mechanistically narrow scope of the definition, "the Criterion A problem", suggesting that it should be revised to account for cases outside of extreme stressors like war or rape (Van der Kolk and Najavitis 2013; Cusack et al., 2016; Burback et al., 2023). Additionally there are doubts about whether PTSD is a distinct disorder separate from other stress response disorders, and anxiety, and depression (Balwin et al., 2004; Freedman et al., 2011; Van der Kolk and Najavits, 2013). The emphasis placed on the severity of the stressor rather than the individual's subjective appraisal of it, is also heavily contested. As Marzillier (2014) and others have noted, the perception of threat is subjective, making it impossible to describe trauma-inducing events in objective terms (Baldwin et al., 2004; McLaughlin et al., 2015; Boals, 2018; Brewin, 2020; Muthu, 2021; Kiyimba et al., 2022). In contrast, there are others who oppose the "concept creep" and widening of the scope, fearing it will lead to a 'culture of trauma' which pathologises normal human experiences (McNally, 2009; Morris, 2015; Haslam, 2016).

Amid these debates, the most pressing concern, particularly for this dissertation, is the possibility that many individuals suffering from Post Traumatic Stress Symptoms (PTSS) may not meet the criteria for a PTSD diagnosis (Stein et al., 2014; McLouglin et al., 2017; Zammit et al., 2018; Davis et al., 2022; Burback et al., 2023). This is commonly referred to as "subclinical/subthreshold/sub diagnostic" or "partial" PTSD (McLaughlin et al., 2015; Zammit et al., 2018). These individuals often remain undiagnosed or receive other diagnoses, leading to inadequate treatment (Cukor et al., 2010; McLaughlin et al., 2015; Greenberg, 2020; Davis et al., 2022). The important point here is that sub-clinical or partial PTSD is likely more prevalent than commonly acknowledged (Zammit et al., 2018; Burback et al., 2023). This may have implications for the use of MM with individuals without a PTSD diagnosis, who may still be highly traumatised. Furthermore, this increases the risk of adverse effects, highlighting the need for teachers to be trauma-informed, at the very least (Treleaven 2018; Farias et al., 2020; Britton et al., 2021).

## 2.2 The Impact of PTSD on the Brain and Body

### 2.2.1 The Hijacked Mind

PTSD alters the way the brain processes information (Fitzgerald et al., 2018). This can lead to difficulties with self-regulation in multiple domains (Harnett et al., 2020). Clinical hallmarks include intrusive traumatic memories and flashbacks, anxious avoidance, reduced focus and concentration, lack of trust in oneself and others, reckless or self-destructive behaviour, feelings of guilt and shame, feeling out of control (APA, 2013; Burback et al., 2023). Other symptoms may consist of irritability, angry outbursts and disturbed sleep (APA, 2013; Boyd et al., 2018). Furthermore, there are two types of PTSD: one with symptoms of hyper-arousal and another with those of hypo-arousal, so sufferers may either feel constantly on edge or in a state of perpetual shutdown (Gandubert et al., 2016; APA, 2017; Porges 2007, 2022). **Table 1** in **Appendix 3** contains an overview of these symptom clusters.

### 2.2.2 The Disembodied Self

PTSD is a whole-system disorder with a profound impact on the body (Levine, 2010; Pitman et al., 2012; Pacella et al., 2013; Porges 2011, 2022; Odgen and Fischer, 2015; Van der Kolk, 2000, 2015; Treleaven, 2018; Kearney and Lanius, 2022; Pierce and Black, 2023). The body's endocrine, neuromuscular, cardiovascular, immune and nervous systems become maladaptive, leading to a range of unpleasant physical symptoms, such as sensory overload, fatigue, pain, muscle tension, dizziness, headaches, and digestive issues (Pacella et al., 2013; Gerge, 2020; Kearney and Lanius, 2022). Furthermore, this cascade of symptoms can create a vicious cycle, further sensitizing the brain and exacerbating the condition (Pacella et al., 2010; Van der Kolk, 2015). Ultimately, as the system is in a constant state of alarm, the individual's stress tolerance or "window of tolerance" (Siegel 1999) is very low, beyond which further distress sets in quickly (Van der Kolk, 2015; Porges 2022; Kearney and Lanius, 2022).

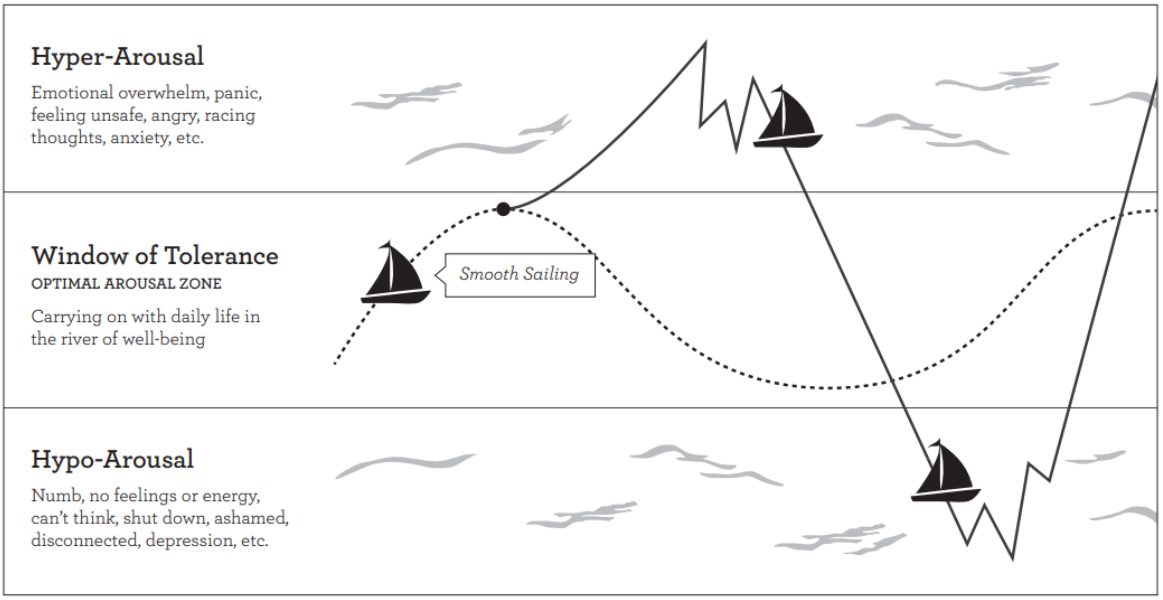


**Figure 1. Window of Tolerance.** Source: University of Maynooth

## 2.3 Trauma Theory

Due to the complexity of trauma, the subject has consistently challenged the boundaries of various disciplines leading to theories emerging from various fields like psychology, history, medicine, and science (Herman, 2015, 2022; Kiyimba et al., 2022).

### 2.3.1 Conceptual Frameworks: The Clash of Philosophies

It is essential to examine the fundamental theories surrounding the functional and organic mechanisms that contribute to the development and maintenance of PTSD as these have been most influential on treatment approaches. Understanding these concepts also contextualises the potential role of MBIs as supplementary approaches. Current theories remain largely divided into two orientations: the psychological and biological approaches.

### 2.3.2 Psychological Theory (Top-Down)

PTSD has historically been perceived and treated as a psychological phenomenon, a condition whose challenges lie solely in the mind (Pierce and Black, 2023). Psychological theories primarily focus on cognitive models of PTSD derived from behaviourism (Sakellariou and Stefanatou, 2017). These include classical and operant conditioning theories such as fear learning and conditioning (e.g. Mowrer's two-factor theory (1947)) and information processing theories such as Foa and Kozak's (1986) emotional processing model (Carson and Dalenberg, 2000; Szoke et al., 2021; Wiliston et al., 2021). Trauma Focused (TF) psychological therapies are the recommended treatments for PTSD according to current International Clinical Practice Guidelines (APA, 2017; NICE, 2018; Bisson et al., 2019). These therapies, such as Prolonged Exposure (PE) therapy, trauma-focused cognitive behavioural therapy (TF-CBT) and Eye Movement Desensitization and Reprocessing (EMDR), work on the premise that approaching distressing thoughts, feelings or memories in concentrated doses will result in a gradual unlearning or uncoupling of the fear response associated with them (Lang et al., 2012, 2017; Schnyder et al., 2015; Banks et al., 2015; Cusack et al., 2016; Metcalfe et al., 2020). In contrast, non-TF psychological interventions, such as CBT and psychotherapy, focus on the individual's preexisting cognitive schema and excessively negative interpretations about the event in an attempt to cognitively reappraise them (Horowitz, 1986, 2020; Brewin, 2020).

Of note is that the language of top-down and bottom-up processing is drawn from the neurophysiology of the brain, specifically the upper and lower brain centres. Psychological treatments largely work on "top-down" processing focusing on the more rational, conscious, cognitive upper part of the brain (neocortex). In contrast, the biologically informed "bottom-up" approaches work on the reptilian, fear-based limbic system and lower brainstem-level somatic sensory processing (Greenberg, 2020; Kearney and Lanius, 2022). Knowing the distinction between these two approaches is key in understanding and treating PTSD (Van der Kolk, 2015).

### 2.3.3 Biological Theory (Bottom-Up)

Neuroscience has provided evidence of biological abnormalities of PTSD that affect the functioning of the endocrine, immune and nervous systems (Fani et al., 2015; Harnett et al., 2020; Tang and Tang 2020). It also legitimised the disorder and enabled its objective

measurement in the evaluation of treatments (Pitman et al., 2012; Heningsberg et al., 2019; Pierce and Black, 2023). Although neuroimaging has supported most cognitive theories, it is now understood that trauma is much more than a cognitive issue - it is largely affective and somatic, and treatment must include the body (Herman, 1998, 2022; Van der Kolk, 2015; Porges, 2007, 2022; Schwartz and Maiberger, 2018; Greenberg, 2020; Gerge, 2020, Kearney and Lanius, 2022; Reed et al., 2022; Pierce et al., 2023). Of note is Porges' Polyvagal Theory (1995) which offers a "bottom-up" perspective that explains how trauma is stored in the body which leads to dysfunctional biopsychosocial responses in individuals (Porges, 2007, 2022).

### 2.3.4 Gap in Treatment: Calming the Autonomic Storm

Pharmacological approaches for PTSD have had limited success in treating the disorder (McFarlane, 2019; Barback et al., 2023). Although exposure-based psychological treatments remain the most empirically supported treatments for PTSD (APA, 2017; Roberts et al., 2019), the effectiveness of these approaches is often questioned (McFarlane, 2019; Gerge, 2020; Edwards Stewart et al., 2021; Bisson and Olaff, 2021; Barback et al., 2023). The issue seems to lie in the limited success of top-down therapies in reversing conditioned neurophysiological and neurohormonal responses in the body (McFarlane, 2019; Gerge, 2020). Top-down cognitive approaches are therefore limited in widening the window of tolerance as they do not resolve physiological hyperarousal, leaving the system vulnerable to threatening stimuli (Van der Kolk and Navaris, 2013; Solomon and Heide 2015; Gerge, 2020). Porges's concept of 'neuroception' helps to explain why these therapies are limited: the nervous system may be adjusting neurobiologically in the body even if an individual is not consciously (cognitively) aware of any danger (Porges, 2007, 2022). Thus, until containment skills are established, exposure-based approaches may have harmful effects for some, effectively re-traumatising sufferers (Herman, 1998, 2022; Banks et al., 2015; Gerge, 2020; Metcalf et al., 2020; Bisson and Olaff, 2021). Furthermore, dropout rates tend to be high with these approaches as many individuals are reluctant to directly address traumatic memories, and many more retain diagnosis post-treatment (Kearney and Simpson, 2015; Foa et al., 2018; McFarlane, 2019;

Kitchiner et al., 2019; Lewis et al., 2020; Metcalf et al., 2020; Haider et al., 2021; Bisson and Olaf, 2021; Davis et al., 2022).

### 2.3.5 Ending the Mind-Body Dichotomy: Towards a Hybrid Approach

Critics of the 'biological turn' claim that the full PTSD experience cannot simply be reduced to neurobiological narratives (Compson, 2014; Gandubert et al., 2016). Ultimately, neither of these approaches fully explains PTSD in its entirety (Kearney and Lanius, 2022). There is no doubt that neurobiology and psychology are linked; the bi-directional neural pathways between the brain and body mean that anything affecting one affects the other (Porges, 2022; Kearney and Lanius, 2022). However, finding more effective treatments has been a challenge (Gandubert et al., 2016; Sakellariou and Stefanatou, 2017; Whitfield, 2021). Notwithstanding, treatment can be approached from both top-down and bottom-up perspectives, with the ultimate goal of strengthening both processes and recalibrating the brainstem-level ANS dysfunction that has set in (Johnson, 2012; Tang et al., 2015: Greenberg, 2020; Pierce and Black, 2023). MBIs have gained attention as they have been shown to impact both top-down and bottom-up processing, bridging this brain-body disconnect (Chiesa et al., 2013; Boyd et al., 2018; Nakamura et al., 2021; Williston et al., 2021; Kearney and Lanius, 2022; Kang et al., 2022). Of note is that MBIs are not being considered as replacements of traditional treatments, but rather as supplementary approaches (Boyd et al., 2018).

## 2.4 The Neuroscience of PTSD, a Disorder of Circuits

Brain imaging in those with PTSD has identified a circuitry of key brain regions involved (Fani et al., 2016; Fenster, 2018). To better understand the potential impact of MBIs in Chapter 6, it is important to outline these changes. The Amygdala, Prefrontal Cortex (PFC), and Hippocampus are the main areas of the brain affected (Shin et al., 2006; Hayes et al., 2011; Vermetten et al., 2015; Fenster et al., 2018; Henigsberg et al., 2019; Harnett et al., 2020; Dennis et al., 2021). These areas are related to the three neural networks that are essential to higher-

order cognitive functioning - Monon's 'triple network model of psychopathology': the default mode network (DMN), the salience network (SN), and the central executive network (CEN) (O'Donnell et al., 2016; Williston et al., 2021). They play a critical role in cognitive-affective and memory processes, as well as in healthy emotion regulation (Fani et al., 2016; Wielgosz et al., 2019; Harnett et al., 2020; Kearney and Lanius, 2022). Other areas such as the Insula, Thalamus, and dorsal Anterior Cingulate Cortex (dACC) are also affected (Fenster et al., 2018). Furthermore, as outlined in Chapter 1, changes to the ANS and the Hypothalamus-Pituitary-Adrenal (HPA) axis, core features of the stress response, have been well documented in PTSD (Alvares et al., 2016; Schneider and Schwerdtfeger, 2020). Consequently, individuals with PTSD may experience impairments in concentration, attention, planning, emotion regulation, and working memory (Yehuda et al., 2015; Fitzgerald et al., 2018). **Table 2** in **Appendix 4** contains an overview of these affected brain areas.

### 2.5 Mindfulness

Mindfulness entails awareness and relationality; being aware of one's immediate experience and having the ability to relate to that experience in a particular way (Nairn, 2001; Chiesa et al., 2011; Kabat-Zinn, 2018). Meditation is a practice that helps one attain a state of mindfulness (Briere, 2015). There is no one definition of mindfulness, but the definition proposed by Bishop et al., (2004, p.232) is adequately comprehensive: *"..the self-regulation of attention, so that it is maintained on immediate experience, thereby allowing for increased recognition of mental events in the present moment…adopting a particular orientation towards one's experience in the present moment, an orientation that is characterized by curiosity, openness and acceptance*".

Meditation is frequently used as an umbrella term encompassing a wide range of practices (Gibson, 2019; Wiliston et al., 2021). Meditation in the context here refers to mindfulness meditation (MM). It is important to note that different practices may cultivate different attentional stances, such as focused attention meditation versus open monitoring meditation, which may correspond to different brain areas (Goleman and Davidson, 2018; Wielgosz et al., 2019; Tang and Tang, 2020).

## 2.6 Mindfulness and PTSD

MBIs such as Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT) have been applied to a wide range of conditions with some positive results (Goyal et al., 2014; Boyd et al., 2018; Van Dam et al., 2018; Wielgosz et al., 2019; Tickle et al., 2020). Compared to exposure therapies, MM has been found to be as effective as psychological therapies, with lower dropout rates (Frost et al., 2014). The theoretical basis of these approaches is thought to target several core features of PTSD such as avoidance, hyperarousal, and emotion regulation (Boyd et al., 2018).

### 2.6.1 Mechanisms of Mindfulness

Research has shown promising evidence that MM can improve overall self-regulation by enhancing attention control, emotion regulation, and altered self-awareness (Fox et al., 2014; Tang et al., 2015; Boyd et al., 2018; Kang et al., 2022). Moreover, increased awareness and acceptance of the present moment may contribute to lower symptom severity, arousal, and depression in those with PTSD (Thompson et al., 2011; Vujanovic et al., 2011; Kang et al., 2022). Notwithstanding, empirical evidence on the specific facets or components involved is lacking (Crane et al., 2017; Goleman and Davidson, 2018). However, several components of mindfulness have been identified as the mechanisms which may bring about change in PTSD (Lang et al., 2012, 2017; Boden et al., 2012; Banks et al., 2015). The key components are awareness of the present moment, intentional regulation of attention, and “attitude”, which encompasses observing, describing, acting with awareness, non-judging, and non-reactivity (Bishop et al., 2004; Shapiro et al, 2006; Nairn, 2001; Kabat-Zinn, 2004, 2013; Kearney and Simpson, 2015; Kang et al., 2022). These work in tandem and are thought to also target the core capacity of meta awareness (Hölzel et al., 2011; Wielgosz et al., 2019). Formal MBIs typically integrate these components into their practices.

What follows is an overview of how these mechanisms may be applied to PTSD. **Table 3** in **Appendix 5** contains an overview of same.

### 2.6.2 Awareness, Attention and Attitude

A hallmark of PTSD is avoidance; this includes avoidance of difficult emotions (numbing), unpleasant bodily sensations, and reminders of the traumatic experience (Williston et al., 2021). Mindfulness is distinct from other approaches in that instead of avoiding or challenging difficult or traumatic content, the focus is on engaging with it in a different way, changing how one relates to it (Williston et al., 2021). The practice of awareness, an active ingredient in MM, is essential in accepting our experience as it is, without reacting to it. It can be understood as being fully present to internal and external experiences as they are, and is cultivated through purposeful regulation of attention to the present moment (Kabat-Zinn, 2004, Bishop et al., 2004; Chisa et al., 2011; Tang and Tang, 2020).

In contrast to exposure therapies, individuals are encouraged to gently approach and simply notice inner experiences (Briere, 2015; Boyd et al., 2018; Tang and Tang, 2020). As this may initially increase distress and exacerbate symptoms, learning containment skills is an essential prerequisite (Treleaven, 2018; Van Dam et al., 2018; Wong et al., 2018). This is cultivated by repeated focus on the breath, body or other focal point, whereby individuals develop regulatory attentional skills to consciously direct their focus away from overwhelming thoughts or sensations onto the present moment (Bishop et al., 2004; Chiesa et al., 2013; Magyari, 2015; Sumantry and Stewart, 2021). Furthermore, these skills enable individuals to direct their attention to that which best supports them to regulate their ANS. This reduces arousal symptoms and increases the ability to tolerate distress, thereby stabilising, and later widening, their window of tolerance (Lang et al., 2017; Hölzel et al., 2011; Metcalf et al., 2019: Nakamura et al., 2021; Pierce and Black, 2023).

To achieve this, the attitudinal qualities of acceptance, curiosity, non-judgement, and compassion are encouraged (Nairn, 2001; Goldstein, 2018; Kang et al., 2022). Arguably, without these qualities, especially compassion, increased present-moment awareness may be harmful (Segal et al., 2013). It is thought that this combination of components, working synergistically, may enable individuals to feel safe and become more comfortable with

tolerating stimuli previously avoided, gradually unlearning conditioned fear responses (Folette and Vijay 2009; Hölzel et al., 2011; Lang et al., 2012, 2017; Boyd et al., 2018; Wiliston et al., 2021). Furthermore, observing thought meditation cultivates skills of non-reactivity and decentering, which may help individuals to shift away from rumination, thought to be significant in the development and maintenance of PTSD (Lang et al., 2012; Kok and Singer, 2017).

### 2.6.3 Reclaiming the Body

These skills may also help individuals to gradually come back into the body, a "*container of dread and horror*" for some with PTSD (Ogden and Fischer, 2015 p. 66; Van der Kolk, 2015; Treleaven, 2018; Pierce and Black, 2023). As previously outlined, until this changes, it makes any kind of top-down therapy very difficult to engage in. Herman, Van der Kolk, and others, like Pierre Janet long before them, are all of the view that stabilising symptoms must come first (Herman,1998, 2015, 2022; Van der Kolk, 2015; Porges 2007, 2022; Gerge, 2020; Kearney and Lanius, 2022). Moreover, congruent with Hermans's (1998) phase 1 of trauma treatment, Van der Kolk (2015) posits that this involves calming down the nervous system and establishing safety in the body.

Practices such as the Body Scan may improve interoceptive awareness, the process of sensing, interpreting, and regulating bodily signals, which is crucial for self-regulation (Kok and Singer, 2017; Fischer et al., 2017; Kang et al., 2022; Guu et al., 2023). This attention-focusing practice involves non judgementally observing physical sensations, cognitions, and emotions, leading to greater embodiment and acceptance (Dreeben 2013; Farb et al., 2013). This may help to counter avoidance and dissociative tendencies sometimes found with PTSD (Hölzel et al., 2011; Gerge, 2020; Kearney and Lanius, 2022; Gibson, 2019; Pierce and Black, 2023).

### 2.6.4 Cognitive Affective Neural Functions

A core impairment in PTSD is emotion dysregulation, which may oscillate between over- and under-emotion modulation (Burback et al., 2023). This can be characterized by heightened intense emotions and inappropriate fear responses, but without the ability to control them (Shin et al., 2006; Hölzel et al., 2011; Hayes et al., 2011; Pitman et al., 2012; Van der Kolk, 2015). It is due to an imbalance between the amygdala (the brain's smoke detector) and the PFC in the brain (Shin, 2006; Tang and Tang, 2020). The amygdala overreacts to perceived threats while the PFC, which normally inhibits the amygdala, is impaired (Van der Kolk, 2015, Akiki et al., 2017; Fensten et al., 2018; Tang and Tang, 2020; Manthey et al., 2021, Kearney and Lanius, 2022). It is thought that MM practices help improve emotion regulation in those with PTSD by strengthening the PFC, thereby restoring the top-down mechanism of moderating hyperactivity in the limbic regions, reducing hyperarousal and intrusion symptoms (Hölzel et al., 2011; Tang and Tang, 2020; Nakamura et al., 2021). In addition, improved neural activity and grey matter volume in the hippocampus, the ACC, the insular and limbic region, all areas known to be impaired in PTSD, have also been found with MM (Boyd et al., 2018; Gibson, 2019; Tang and Tang, 2020; Nakamura et al., 2021). Finally, other studies suggest that MM can lead to positive neuroplastic changes to brain structure and function, resulting in improved cognitive and affective processing (Allen et al., 2012; Hölzel et al., 2011; Fox et al., 2016; Williston et al., 2021; Sumantry and Stewart, 2021).

# 3. CHAPTER 3: RESEARCH QUESTION, RESEARCH APPROACH AND METHODOLOGY

This section presents the research question, and a discussion about the research approach taken, including the methodology selected. Following this, an overview of the data collection and selection process is outlined. Finally, ethical considerations are discussed along with an outline of the mechanisms used to assure quality and minimise the risk of bias.

## 3.1 Research Question

The purpose of this dissertation was primarily to examine the efficacy of MBIs on PTSD to learn what works, why, and what might need to be changed.

### 3.1.2 Research Gap

There has been a large body of research on PTSD as a clinical disorder (Burback et al., 2023) and as outlined in Chapter 2, the efficacy of recommended first line treatments is limited (Lewis et al. 2020; Gerge, 2020). As they involve both top-down and bottom-up processing, there has been increasing interest in the use of MBIs in treating the disorder. For this reason, I wanted to examine the research to assess the evidence linking facets of mindfulness directly to changes in PTSD. Furthermore, given the degree of nervous system impairment in PTSD, and associated risk of adverse effects, I was curious about the lack of tailored MBIs for PTSD, as has been done for depression - MBCT (Segal et al., 2002), substance misuse - MBRP (Vallejo and Amaro, 2009), and Interpersonal Violence (IPV) - trauma-informed MBSR (TI-MBSR) and MBCT (TI-MBCT) (Kelly and Garland 2016; Pitt et al., 2020). Therefore, I also wanted to assess the findings to establish if there was evidence therein of the need to tailor an MBI specifically for this population.

### 3.1.3 How will the research address the research question?

Undertaking a Systematic Review (SR) enabled me to gain a comprehensive overview of the available evidence in the field and to systematically synthesise the key findings. It also allowed me to answer my research questions and to identify gaps for further research. The inclusion of qualitative studies, in addition to quantitative RCTs, helped me to examine, in more depth, the specific requirements of those with PTSD and to identify the need for modifications (Poklepović Peričić and Tanveer, 2019).

## 3.2 Research Approach

### 3.2.1 Introduction

According to Crotty (1998) the research process involves four central aspects that need to be identified; theoretical perspective (ontology), epistemology, methods (techniques to gather and analyse data) and methodology. A good researcher should make explicit the foundational elements of the research approach as this provides both the researcher and the reader, with clarity and transparency regarding the approach being taken (Crotty, 1998).

### 3.2.2 Research Paradigm

This section outlines how I chose the research paradigm of Pragmatism.

A researcher's 'paradigm' is their worldview when looking at phenomena (Cohen et al., 2018). This paradigm includes their assumptions and beliefs about the nature of reality (ontology) and how knowledge is acquired (epistemology) (Neuman, 2013; Cohen et al., 2018). As these views influence how the research is conducted, a brief description is provided here.

Ontology contains two main positions, realism and nominalism. Realism states that the world and its objects exist 'out there', independent of the observer (Neuman, 2013; Cohen et al., 2018). Data can be observed, independent of any subjective interpretation, can be tested

empirically and is replicable (Cohen et al., 2018). Nominalism, on the other hand, posits that there is no fixed 'out there' world, but that people view reality subjectively through their personal lens (Neuman, 2013).

Epistemology, the study of how knowledge is uncovered, can also be understood through two viewpoints (Cohen et al., 2018). Positivism (now largely replaced by post-positivism (Creswell and Creswell, 2018)), views knowledge as objective, with the researcher taking an observer role (Tashakkiry et al., 2020; Purssell and McCree, 2020). The contrasting anti-positivist (interpretative or constructivist) viewpoint, having origins in hermeneutics, views knowledge as subjective and constructed by the researcher in an interpretive role, assigning meaning to the phenomena under investigation (Crotty, 1998; Tashakkori et al., 2020).

My natural inclination would favour a realist/positivist position as I prefer the analysis of quantifiable data as it is clear, measurable and less open to interpretation. However, as a mindfulness practitioner, I have come to value those aspects of experience that are not so easily measured. Concerning this SR, I initially placed great importance on the quantitative studies and brain science, showing a strong bias towards them. However, I soon realised that my research questions could best be answered by including qualitative studies to identify discrepancies and capture participants' lived experiences of interventions. In contrast to the somewhat reductionist positivist approach, qualitative research seeks to understand peoples' perspectives (Van Manen, 1997). I realised that this would provide a richer understanding of my investigation, overcoming the potential bias of a single approach, and potentially providing a more complete picture (Creswell and Clark, 2018; Tashakkori et al., 2020; Stern et al., 2020).

Therefore, as this SR included studies from two different philosophical positions - quantitative (realist/positivist) and qualitative (nominalist/interpretative) – and synthesised data using several approaches, I needed a paradigm to suit these needs. I, therefore, chose Pragmatism as the most appropriate paradigm, with an underlying positivist leaning due to the primary research question, the number of quantitative studies included, and chosen methodology (SR). Pragmatism is often associated with mixed methods research and is known for its practical, results-based, "whatever works" approach (Creswell and Creswell, 2018; Tashakkori et al., 2020). It is driven by the needs of the research question and so it often draws on different approaches (numeric and narrative), and different forms of data collection and analysis, as

needed, giving the researcher much flexibility (Creswell and Creswell, 2018; Cohen et al., 2018).

### 3.3 Study Design and Method

This SR is essentially one secondary study of two sets of findings of primary studies, gathered by researchers using two different paradigms. There has been much debate regarding the inclusion of both qualitative and qualitative studies in reviews and the mixing of paradigms in methodologies (Cohen et al., 2018; Tashakkori et al., 2020; Hong, 2020). It is not in scope here to detail the nuances of this ongoing long-standing debate on "dialectic pluralism"; what is of note is that more recently, there is a wide range of overarching paradigm stances available when including diverse paradigms in one review (Sandelowski et al., 2006; Creswell and Creswell, 2018). Reviewing the literature on this is a bit of a minefield, with no single approach being universally accepted. There is some disagreement on the distinction between "mixed methods" and "multi methods", which are sometimes used synonymously. A "mixed method" approach may be defined as a single study with multiple strands that all address a research question (Tashakkori et al., 2020). However, according to Sandelowski et al., (2006; 2014) if a researcher is undertaking a SR (i.e. secondary research) and reviewing primary qualitative, quantitative, and/or mixed methods studies, it is termed a "mixed studies review" or "mixed research synthesis", as opposed to "mixed methods". Furthermore, it would appear that for some, the distinction hangs on whether the data is *integrated*: from a strictly methodological perspective, integration is an essential component of "mixed methods" research but is not required in "multi method" studies (Sandelowski et al., 2006, 2014; Plano Clark and Ivankova, 2016; Hong, 2017; Anguera et al., 2018). Notwithstanding this debate, for the sake of simplicity, the terminology of the method used in this SR is a "mixed method" approach.

### 3.4 Methodology

The choice of methodology used in any research approach needs to be considered and justified to ensure that the piece of enquiry will answer the research question (Crotty, 2014). Given that my research question involved examining a body of existing published work, an SR seemed the most appropriate methodology. SRs are considered to be the best way to objectively appraise and synthesise the findings of several studies relating to a specific question (Boland et al., 2017; Cohen et al., 2018; Stern et al., 2020). They are quantitative in nature as they follow an explicit 'systematic' protocol, which is reproducible, outlining detailed procedural steps about the ways that studies are identified, selected and analysed (Pickering and Byrne, 2014). They can be used to review quantitative, qualitative and mixed methods literature, and are recognised for minimising bias (Pickering and Byrne, 2014; Khoo-Lattimore, 2019). Due to their fundamental scientific protocol, SRs are associated with positivism (Pickering and Byrne, 2014).

Consideration was given to the method used to synthesise findings (Luca et al., 2007). Both sets of data in this SR were analysed using a *convergent segregated approach* for synthesis and integration. In contrast, the less common *convergent integrated approach* – whereby qualitative findings are transformed into quantitative data (quantitising), or quantitative findings are transformed into qualitative data (qualitising) - is more appropriate when both data sets can address the same primary question, which was not the case here (Pearson et al., 2015; Hong et al., 2017, 2020; Stern et al., 2020). The convergent segregated approach was adopted for this SR (see **Figure 2**. below) because it was most appropriate for my research questions and for the type of SR that was used here, which was analysing an intervention for effectiveness (quantitative) and addressing questions of meaningfulness/experience (qualitative). With this approach, separate quantitative and qualitative synthesis were carried out independently, followed by their integration into a framework based on themes, to produce an overall configured narrative analysis and discussion (Pearson et al., 2015; Stern et al., 2020).

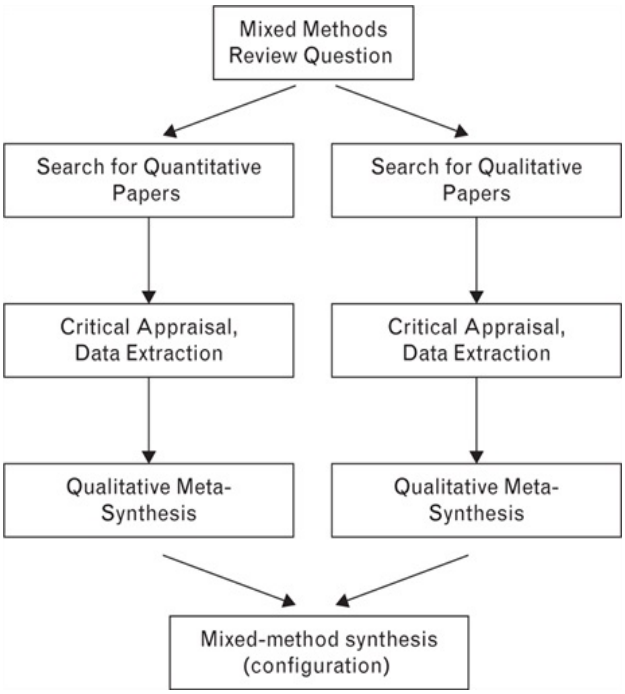


**Figure 2. Convergent Segregated Synthesis** (adapted from Sandelowski et al., 2006).

In sum, a pragmatist paradigm was chosen using a mixed method study design and a SR as the methodology, which used a convergent segregated approach and a thematic analysis to synthesise findings.

### 3.5 Data Collection

The studies were collected in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009). A comprehensive search strategy was carried out in Jan 2023, and repeated in April 2023, using primarily PRIMO, Google Scholar, PubMed and PsycINFO using keywords relating to PTSD and MBIs. To retrieve the broadest set of search results, no limits were put on the publication date. A nesting approach was used, using the Boolean operators AND and OR, to search for peer-reviewed articles using the following search strings:

(mindfulness OR MBI OR mindfulness-based intervention OR Mindfulness-Based OR mindfulness intervention) and (PTSD OR post-traumatic stress disorder OR post-traumatic OR posttraumatic)

AND (RCT OR randomi*ed );

Then with

AND (quantitative OR qualitative OR mixed methods)

Additional results were obtained by using complementary searching activities such as reviewing references cited, hand-searching and citation chaining, a best practice in SRs (Boland et al., 2017). This resulted in a total of 598 studies to be reviewed, initially at a high level. A skim reading of titles, and then abstracts, was conducted, and studies were eliminated as relevant. Of 126 studies remaining, a more detailed review was carried out, further narrowing down the selection of papers to be included. Details of this process are included in **Figure 3** in the PRISMA Flow diagram attached in **Appendix 6**. The final 29 studies for the SR were extracted and tabulated in an Excel spreadsheet (See **Table 4** in **Appendix 7**). This aids the examination and assessment of studies and facilitates comparison and synthesis (McKenzie et al., 2022).

### 3.6 Study Selection

The 29 studies included in the SR were selected using the following criteria:

**Inclusion Criteria:**

1. Studies using an intervention that is mindfulness-based where mindfulness is the core component throughout.
2. Studies that evaluated the effect of an MBI as a monotherapy.
3. Study duration of 8 weeks min.

4. Adult sample aged 18+.
5. Used a reliable and validated measure of PTSD pre- and post-intervention (a clinical diagnosis or a clinically meaningful score on an established PTSD assessment scale (Clinician-Administered PTSD Scale [CAPS], PTSD Checklist [PCL]).
6. Studies with RCTs regardless of control condition (e.g., TAU, waitlist, no treatment, or other active treatments).
7. Any publication date or country of origin.
8. Published in English.
9. Published in peer-reviewed journals.
10. Studies using quantitative, qualitative or mixed methods.
11. Clinical and non-clinical populations and settings.
12. Meta analysis.

**Exclusion Criteria:**

1. Mixed-intervention studies i.e., mindfulness combined with PE, CBT, EMDR.
2. Interventions that have mindfulness as an adjunctive component i.e. ACT, DBT.
3. Studies using only certain types of meditation, such as mantram, transcendental, lovingkindness, compassion-based, yoga, qigong, or body based.
4. Scoping reviews, case reports and case studies.
5. Dissertations.
6. Studies with incomplete or insufficient data.

### 3.7 Data Analysis

Data was extracted and tabulated per the criteria outlined in the Cochrane Handbook of Systematic Reviews (Higgins et al., 2022). This data was sufficiently comprehensive to adequately describe the details of the studies under the following headings: study design, participants, intervention, control, outcome, and limitations. Details of attrition and adverse

effects were also captured. For the qualitative studies, participants' quotes were extracted, as relevant.

An overview of the studies' characteristics is presented in Chapter 4 using a narrative synthesis approach. In Chapters 5 and 6, in discussing the findings, a Thematic Analysis (TA) is used, which is an umbrella term to describe a range of methods for data analysis. This is a practical approach which offers the researcher flexibility in identifying numerous themes across the entire dataset (Braun and Clarke, 2006; Alhojailan and Ibrahim, 2012). It was used here to facilitate and present a wider understanding of the issues identified (Alhojailan and Ibrahim, 2012).

### 3.8 Ethical Considerations

As there is the possibility that SRs may contain studies with ethical issues therein, there is an onus on researchers to, at a minimum, scan studies for ethical insufficiencies (Vergnes et al., 2010; Suri, 2020). Therefore, the studies were assessed to ensure that ethical procedures were adhered to. As an added assurance, only studies published in reputable peer-reviewed journals were included. The University of Aberdeen Ethical Approval, submitted as part of the Full Proposal, is attached in **Appendix 1.**

Finally, I am generally aware of my own biases and preferences, and my aim was to be honest and transparent and to explore the studies with objectivity and impartiality in order to present an accurate representation of the work thus far.

### 3.9 Potential Methodological Issues

Although SRs are considered to be objective due to their rigorous and transparent methods, they are still subject to limitations and potential errors (Owens, 2021). The studies needed to be assessed for bias, including selection and publication bias, and for quality in terms of design and conduct (Boland et al., 2017). The Cochrane Risk-Of-Bias 2 tool was of use in this regard (Higgens et al., 2022). In addition, as it is recommended to use data management tools to

facilitate the collection and analysis of data, Excel was used for this purpose. This increases the accuracy of the review and adds efficiency to the process (Owens, 2021).

Finally, in any SR, the research approach chosen by the researcher will influence how the research is presented. The TA approach used in Chapters 5 and 6 requires the researcher to '*both interrogate and harness the value o*f' their subjectivity (Braun & Clarke, 2021, p. 6). For this reason, reflexivity was essential to all parts of this process including analysis, synthesis and discussion (Forbes 2022). Furthermore, this helps to enhance transparency and credibility, especially when one is working alone (Purssell and McCrae, 2020; Forbes, 2022).

# 4. CHAPTER 4: SELECTED STUDIES

Details of the selected studies are presented in this chapter.

## 4.1 Study Selection Process

The PRISMA flow diagram, (**Figure 3,** attached in **Appendix 6**), outlines the process used to select studies for inclusion in this SR. A total of 598 studies were initially identified as eligible for review. After the removal of duplicates and excluding studies based on a review of titles and abstracts, 126 full-text articles were further assessed. 97 were excluded for various reasons; not being an MBI, MM not being the central component of the intervention, cases studies etc.

Key data relating to each study is summarised in **Table 4** in **Appendix 7**.

### 4.1.1 Control of Bias

Bias can occur in SRs due to the actions of the authors of the included studies or of the author of the SR itself (Hopp, 2015). According to Goleman and Davidson (2018) accepting findings without rigorously evaluating them simply because they are published in a peer-reviewed journal, is all too common. Appraising this risk in the studies is important in detecting the quality of the studies, which may influence the quality and findings of the SR itself (Munn et al., 2023). This risk of bias is multifaceted in that it may be in how the data was analysed, synthesised or due to missing or omitted results. Furthermore, the authors may have had a conflict of interest (Sterne et al., 2019). Both the Cochrane Handbook for Systematic Reviews of interventions, and the Joanna Briggs Institute provide some guidance on how to assess for risk of bias covering areas such as selection, performance, detection, attrition and reporting bias (Hopp, 2015; Sterne et al., 2019). With this in mind, and to ensure, as much as possible, the validity of the primary studies, I reviewed each study to assess the method used, how researchers gathered and measured outcomes, any obvious omitted data, conflict of

interest, unusually long follow-ups, selective reporting of outcomes and any other limitations (Hopp, 2015; Goleman and Davidson, 2018).

## 4.2 Study Characteristics

### 4.2.1 Overview

**To reduce word count, the selected studies in this SR are coded as P1-P29 in this chapter only. Table 4 in Appendix 7 contains the full details of the referenced studies.**

29 studies met the criteria for eligibility and were included in this SR. Of note, P3 is a qualitative follow-up study of a previous quantitative study (Wahbeh et al., 2016), which is excluded from the analysis as the duration was for 6 weeks only. As qualitative studies on MBIs for PTSD are lacking, I felt it was appropriate to include the P3 study for potential insight into participants' experiences.

The 29 studies include 19 primary studies and an additional 7 secondary studies undertaken on 7 of the 19 primary studies.

In total, there are 21 quantitative studies, 3 qualitative studies (P3, P27, P28), 2 mixed methods (P8, P11) and 3 meta-analyses (P13, P21, P29).

### 4.2.2 Participants

The primary studies consisted of 889 participants (figures are based on the number of participants with a diagnosis of PTSD who completed interventions). This figure excludes participants in the meta-analyses as these would have duplicated numbers. The mean age of participants was 44.5, obtained from 17 studies that provided age data. The percentage of male participants was 72%, (28% female), from 19 studies. Four studies included men only (P2, P15,

P18, P22), two studies included women only (P8, P19). All of the studies included adults (18+) as this was an inclusion criterion for eligibility.

All participants had PTSD which was confirmed pre intervention. Ten studies (53%) involved military veterans (P2, P3, P4, P15, P16, P18, P22, P25, P26, P28). One study involved refugees (P1), another university students (P6). Three studies focused on survivors of IPV (P8, P12, P19), and two studies involved survivors of early childhood sexual abuse (CSA) (P9, P10). In P11, participants experienced diverse traumatic events such as a car accident, CSA, physical abuse, or a fire. In P20, participants were survivors of traffic accidents. P27 involved black adults with low socioeconomic resources. Of the three meta-analyses, two focused on veterans, P13 and P29, whereas P21 included a mix of studies on veterans (6), IPV (2), and traffic accidents (1).

### 4.2.3 Settings

The majority of the studies took place in the United States. Other locations were Germany (P11), Israel (P1), Lithuania (P6), Iran (P13, P15) and China (P21, P22).

All of the interventions with veterans took place in outpatient medical centres and VA clinics. For the non-veteran populations, the studies took place in a variety of settings such as in an urban migration setting (P1) and in the shelters or community hospital where participants lived (P8). One study took place online (P6), another over the phone (P22). The remaining studies took place in community settings and mental health centres.

### 4.2.4 Interventions

Of the 19 primary studies, 13 used MBSR, the most commonly used intervention. Included in this are P8, P9, and P19 who adapted their interventions slightly. Also included is P22 which adapted MBSR for a telehealth intervention. The P3 qualitative study was based on an intervention assessing various arms of MBSR. MBCT was used in two studies (P15, P27). Furthermore, three studies used adapted MBIs; a Mindfulness-based internet intervention (P6),

Mindfulness-Based Exposure Therapy (MBET) (P18), and a trauma-sensitive MBI, MBTR-R (P1). The three meta-analyses consisted of a mix of these interventions (P13, P21, P29).

### 4.2.5 Intervention-Control Comparison

As previously mentioned, most research on PTSD has been undertaken with veterans; therefore to be eligible for inclusion, these studies were required to be RCTs. However, to include studies with non-veteran populations, the inclusion criterion for these studies to be an RCT was dropped (see Section 3.6).

All 7 primary quantitative studies with veterans were RCTs using active controls. The most commonly used control was Person Centred Group Therapy (PCGT) (P2, P4, P18, P25). Other controls used were TAU (P16) and socio-therapeutic and psycho-education groups (P15, P22). For the qualitative studies with veterans, no control was referenced in P28, and the control group used in P3 was asked to listen to a book and to sit quietly for periods of time.

For the studies with non-veteran populations, an inactive waitlist control was used in four studies (P1, P6, P19, P27). One study used an active wellness control condition (P12), and one study used an active control of PCGT (P20). No control was used in three studies (P9, P11, P14). A control was referenced in P8 but no details about it were provided (the author was contacted but no reply was received).

### 4.2.6 Length and Frequency

All of the MBIs lasted a minimum of 8 weeks as this was an inclusion criterion. The 13 studies that used MBSR consisted of weekly sessions lasting from 50 -70 mins (P20), 90 mins (P4, P8) and 2 hrs + (P2, P9, P11, P12, P16, P19, P25, P28). In P22, the first two sessions were approximately 45 min in length, with subsequent weekly sessions over the telephone lasting 20 minutes. P14 did not provide the length of weekly sessions. In addition, most of the studies

using MBSR included a full-day retreat towards the end of the intervention. There was no reference to a retreat day in P14, P20, and P22.

The studies using MBCT involved weekly sessions lasting 60-70 mins (P27) and 90 mins (P15). In the studies using adapted MBIs, the internet-based MBI used in P6 consisted of weekly modules, the precise duration of which was not referenced. The MBET used in P18 involved 2 hrs per week for 16 weeks and the MBTR-R used in P1 had 2.5 hr weekly sessions for 9 weeks. Most of the studies, apart from P12 and P20, referenced the requirement of home practice as part of the intervention.

### 4.2.7 Follow-Up Assessments

All of the 19 main studies involved pre- and post-intervention assessments. Three of the studies made no reference to a follow-up assessment beyond this timepoint (P14, P15, P19). Generally, the follow-up periods ranged from 2-4 weeks (P18, P11) to 6 months (P2, P6, P9, P20). P23 is 6-month follow-up of the P22 study. Beyond this, only one follow-up study looked at the longer-term effects of the intervention; P10 is a 2.5-year quantitative follow-up of the P9 study.

### 4.2.8 Outcomes

Data from the quantitative studies was assessed for outcomes on PTSD. Although some studies also included outcomes for comorbidities such as depression and anxiety, only PTSD was in scope for this SR. Studies were also analysed with regard to the secondary objectives of this SR - mindfulness and PTSD, neurobiological mechanisms, evidence of adverse effects and the potential need for modifications.

# 5. CHAPTER 5: DISCUSSION ON PRIMARY OBJECTIVE

The main objective of this SR was to investigate the efficacy of MBIs on PTSD. This chapter contains a detailed analysis of the results of the quantitative studies followed by a discussion on same. The three secondary objectives are discussed in Chapter 6.

## 5.1 Primary Objective: Efficacy

Findings are reported in four categories according to the strength of the comparison control type: Active (specific active, non-specific active) and Passive (waitlist and no control). Specific active controls are therapeutic interventions which are included in the APA's list of evidence-based treatments for PTSD, such as PCGT (APA, 2023) Non-specific active controls include all other types of active interventions such as TAU, and psychoeducation (Mohr et al., 2014; APA, 2023).

### 5.1.1 MBIs with Specific Controls

PCGT was the specific control used in five studies. PCGT is a group form of individual Present Centred Therapy (PCT) and was developed specifically as a comparison therapy for RCTs of exposure-based PTSD therapy (Frost et al., 2014; King et al., 2016). It has various benefits such as group cohesion, education, and psychosocial support (Davis et al., 2019).

In an RCT with 26 veterans, Bremner et al., (2017) found that the MBSR group, unlike the PCGT control group, had significant reductions in PTSD symptoms post-intervention which persisted 6 months later. Similarly, Liu and Qin, (2021) found that MBSR was more effective than PCGT at reducing the symptoms of PTSD in traffic accident survivors, with effects increasing over the intervention duration. Polusny et al., (2015), randomising 99 veterans with PTSD to MBSR or PCGT, also found that both interventions reduced PTSD symptoms, with the MBSR group showing greater reductions, albeit modest, post-treatment and at 2-month follow-up. However, there were no differences between the groups regarding loss of diagnosis

at either timepoint. One reason for this may be that participants randomized to MBSR had higher incidence of previous sexual trauma and had greater PTSD severity at baseline. A study conducted by Kang et al., (2022), analysing EEG measures of neural outcomes in participants of the Polusny et al., (2015) trial, confirmed the findings and found that MBSR was superior to the control in improving various cerebral functions.

Getting slightly different results using MBET and PCGT in an RCT with 23 veterans, King et al., (2016) found that both treatments reduced PTSD symptoms, although between-group differences were insignificant. Furthermore, results are heavily caveated because the randomisation was incomplete due to the PCGT arm being discontinued. In contrast, in a larger trial, Davis et al., (2019) cautioned against the use of MBSR over other effective trauma treatments. Using an RCT with 142 veterans, they found that although MBSR and the PCGT group both improved PTSD symptoms, MBSR did not have a significant advantage over PCGT. What is noteworthy from this study is that different PTSD measurement instruments produced different results. Using the clinician-administered CAPS scale, no statistically significant differences in PTSD were found between the groups, yet in the self-reported PCL scale, a statistically greater improvement in PTSD was initially observed in the MBSR group, although not maintained. Both tools are commonly used in assessing PTSD and have evidence of reliability and validity (APA, 2023). In this case, the authors proposed that the difference may be attributable to veterans in the MBSR group perceiving a clinical improvement not noted by investigators.

### 5.1.2 MBIs with Nonspecific Controls

Niles et al., (2012) used a novel telehealth approach in an RCT to compare MBSR with psychoeducation in veterans. The study showed that post-treatment, only the MBSR group had a clinically significant improvement, but effects were not maintained at 6 week follow-up. Like with Davis et al., (2019), there was a difference in the results of the two instruments used (CAPS 38.5% versus self-report PCL 53.8%). The authors surmised that half of the variance could be attributable to the large effect sizes. Notwithstanding, they maintained that the effects of MBSR, albeit temporary, were robust and may be sustained with continuation of practice.

In an RCT with 47 veterans, Kearney et al., (2013) found no significant difference in outcomes when using MBSR and TAU as the control. However, a post hoc analysis found clinically meaningful benefits in both PTSD and quality of life at 4-month follow-up for those randomized to MBSR (27.3%) as compared to TAU (0%) (Stephenson et al., 2017). Similarly, in an RCT using MBSR for 39 survivors of IPV, Gallegos et al., (2020) also found clinically significant reductions in PTSD symptoms for 50% of the MBSR group post-treatment, but not for the wellness control group, with reductions being maintained at 4-week follow up. Likewise, using MBCT as an intervention in another RCT with 48 veterans in Iran, Jasbi et al., (2018) found that it improved symptoms of PTSD, compared to a socio-therapeutic control condition. Furthermore, they noted a significant Time effect, with large effect sizes for the MBCT group, and small to medium for the control group.

### 5.1.3 MBIs with Waitlist Controls

Using a trauma-sensitive MBTR-R in an RCT with 95 refugees in Israel, Aizik-Reebs et al., (2021) found that MBTR-R was superior to the waitlist control. Reduced levels of PTSD were found at 1-week post-intervention and 5-week follow-up, with effects being moderate to large. Of note is that whilst 48.3% of MBTR-R participants still retained a PTSD diagnosis at 1-week post-intervention, this rose to 62% at 5-week follow-up, which is indicative of effects not being sustained. Results should be viewed in the context of PTSD severity being initially higher in the control group.

Using a trauma-informed MBI (TI-MBSR) in an RCT with 12 survivors of IPV, Kelly and Garland (2016) also found that compared to the waitlist control group, the TI-MBSR group had clinically significant decreases in PTSD. Finally, Dumarkaite et al., (2021, 2022) investigated the effects of an internet based MBI with a waitlist control in an RCT with 53 university students in Lithuania. No significant changes in overall PTSD symptoms were found post-intervention or at 3-month follow-up.

### 5.1.4 MBIs with No Controls

In an uncontrolled study using MBSR with 15 adult survivors of CSA, Kimbrough and Magyari (2009) found that post-intervention, the group experienced a mean 31% reduction in PTSD symptoms. This represented a 53% reduction in the number of participants meeting the criteria for PTSD (7 people) which was largely sustained at 3-month follow-up (9 people). Furthermore, in a 2.5-year follow-up, Earley et al., (2014), found that the mindfulness and PTSD improvements seen at 3 months were sustained at 128 weeks, with the effect sizes being significant for both. At 128 weeks, the number of participants meeting the criteria for PTSD was down further to 8.

In another uncontrolled study using mixed methods, Müller-Engelmann al., (2017) evaluated the efficacy of MBSR with 9 participants with PTSD following various life events. Findings revealed a significant reduction in PTSD symptoms. Significantly, at 1-month follow-up, six of the nine completers no longer met the criteria for PTSD according to the CAPS interview. However, the baseline PTSD scores of those who later dropped out and of those who completed the intervention differed significantly, depending on which assessment tool was used (CAPS v DTS). Alongside similar findings in Niles et al., (2012), Polusny et al., (2015) and Davis et al., (2019), this discrepancy with the assessment tools warrants further attention. Van Dam et al., (2018) recently cautioned against the use of self-reports for the assessment of outcomes and the findings here appear to support this view. It is not within scope here but further analysis of reported differences in results using different instruments for PTSD assessment appears to be necessary in the wider research community. An understanding of the possible causes of these differences, and solutions, could facilitate a more effective comparison of interventions and results.

### 5.1.5 Meta-Analyses Findings

Three meta-analyses are discussed here. Overall, findings show that MBIs had a small to moderate effect size, however, results should be interpreted tentatively, as outlined below.

In a meta-analysis relevant to this SR, Liu et al., (2022) evaluated the efficacy of MBSR in 644 people with PTSD. Nine studies were included, all of which were RCTs. Of those nine, eight are featured in this SR (Kearney et al., 2013; Polusny et al., 2015; Kelly and Garland, 2016,

Bremner et al., 2017; Davis et al., 2019; Gallegos et al., 2020, Liu and Qin, 2021, Kang et al., 2022). This meta-analysis concluded that when compared with all control conditions, MBSR had a significantly pooled moderate effect size. However, they found no significant difference in effect sizes between the control groups. Surprisingly, PCGT was no more effective as a treatment than TAU. The authors suggested that this may be due to the small number of studies involved. An important finding of this study was that MBSR was equally as effective for other traumatised populations as for veterans. Although this finding is caveated by the fact that the majority of studies included veterans, these results indicate the potential suitability of MBSR for different PTSD population cohorts.

Another recent meta-analysis by Goldberg et al., (2020) compared MBIs with a variety of control conditions in veterans. The study involved twenty RCTs, twelve of which evaluated PTSD, with the other eight evaluating conditions such as COPD and depression. Of the twelve looking at PTSD, eight are included in this SR (Kearney et al., 2012, Niles et al., 2012,2013, Poulsny et al., 2015, King et al., 2016, Colgan et al., 2017, Bremner et al., 2017, Jasbi et al., 2018). The remaining four studies evaluating PTSD were excluded from this SR due to ineligibility. Nevertheless, as results were reported by condition and control type, it was possible to isolate out the efficacy for the PTSD studies, albeit for the full twelve. Similar to Liu et al., (2022), post-treatment, for both specific and non-specific active controls, MBIs showed greater efficacy, albeit with wide confidence intervals for both. Follow-up results were only available for the nonspecific controls, with MBIs no longer demonstrating superiority. In contrast to Liu et al., (2022), the pooled effect size for the MBIs when compared to specific controls was lower than when compared to non-specific controls, suggesting, at least in this meta-analysis, that the PTSD-recommended specific treatment controls were a better test of the efficacy of the MBIs. Overall, the study found MBIs to have a small effect on PTSD, but confidence in the findings is lacking due to several factors such as the risk of bias across multiple domains in some studies.

Finally, a very recent meta-analysis of 19 RCTs, by Sun et al., (2021), compared MBIs with a variety of control conditions with veterans. Again, similar to Goldberg et al., (2020) and Liu et al., (2022), they concluded that MBIs significantly reduced PTSD symptoms when compared to all controls. They were also equally superior regardless of format of delivery (group or individual) and duration. Like Liu et al., (2022), no significant difference in effect sizes were

found between the control groups. The overall effect size was small to medium. However, results should be viewed with caution. Although six of the nineteen studies featured in this SR were included (Kearney et al., 2012, Niles et al., 2012, Poulsny et al., 2015, King et al., 2016, Bremner et al., 2017, Davis et al., 2019), various other types of interventions were included with TM, yoga, compassion and breathing based meditations. In addition, duration lengths varied considerably (from just 2 sessions to 22 sessions). Other issues noted in the studies were a high or unclear risk of bias, differing definitions of completion, and general mixed quality.

## 5.2 Discussion on Efficacy

### 5.2.1 Strengths

Overall, the majority of the MBIs demonstrated favourable and superior efficacy with generally small to medium effect sizes compared with controls post-intervention. These findings align with recent meta-analyses on MBIs for other conditions including depression (Reangsing et al., 2021), anxiety disorders (Haller et al., 2021), ADHD (Coissant et al., 2020) and various psychiatric disorders (Goldberg et al., 2018). The majority of the quantitative studies in this SR were RCTs, and most used MBSR, so they shared methodologies, strengthening conclusions. In addition, the studies included populations with PTSD from diverse types of traumatic experiences, across different cultures and settings, suggesting that MBIs may be both amenable and effective with various population types. The use of innovative methods like telehealth (Niles et al., 2012) and an internet-based intervention (Dumarkite et al., 2021) demonstrates the potential of novel and alternative ways of treating individuals who may have limited access to treatment.

## 5.3 Limitations

The studies had several shortcomings which must be considered. Sample sizes were generally small with mostly male participants, different definitions of completion were used, and there

were large variations in dosage and intensity. The quality of studies was mixed, with some having an unclear risk of bias and many RCTs lacked adequate information on the generation of random sequences. MBSR was the most commonly used MBI (13/19), with MBCT used in just two studies so effective comparisons between these two MBIs is limited. The studies also varied in terms of PTSD severity, so caution is necessary when interpreting results. Future research should try to collect data on the length of time since diagnosis, previous treatments, and participants' experience with MM. Furthermore, a standardized definition of the completion rate needs to be used, and the generation of random sequences should be transparently reported.

Several important limitations and cofounding factors were identified. These are presented here along with recommendations as appropriate.

### 5.3.1 Veterans

Half (10/19) of the primary studies were with veterans. It is likely that veterans would have had previous education and exposure to different PTSD treatments (Vujanovic et al., 2011), including mindfulness, and so it is unclear if results with veterans are generalisable to other traumatised populations, and to those without previous PTSD education or treatment. Whether the specific type of trauma experienced by veterans is more or less responsive to MBIs, compared to other types of traumas, is unclear. Despite this, most of the studies with non-veteran participants produced results that indicate the potential suitability of MBIs for different PTSD populations. However, as research has shown that exposure to different types of traumatic events may result in diverse PTSD symptoms (Banks et al., 2015), future studies should try to include larger and more diverse samples across genders, cultures, and types of traumatic experiences to reduce bias and identify individual variables that may affect outcomes.

### 5.3.2 Control Conditions

It appears that the type and strength of the control condition may be significant in assessing the true effects of MBIs post-treatment. Of the five studies using PCGT as a control, three found the MBI to be superior (Polusny et al., 2015; Bremner et al., 2017; Liu and Qin, 2021). In contrast, PCGT was found to be equally effective as the MBI in the other two (King et al., 2016 and Davis et al., 2019). Of note is the dosage in these studies. In the King et al., (2016) study, the MBET participants attended more sessions than the PCGT participants, yet the results were equally effective! Similarly, in the Davis et al., (2019) study, the MBSR group had a six-hour retreat which the PGCT group did not have, yet both interventions were equally effective! Furthermore, in Polusny et al., (2015), where MBSR was found to be superior, the MBSR groups met for 2.5 hours weekly compared with 90 minutes for the PCGT group, giving MBSR a significant advantage. These details suggest that MBIs for PTSD have not yet been rigorously tested, leaving the possibility that claims of their superior efficacy have been overstated. Given these results, it would seem that more RCTs using "gold standard" first-line treatments for PTSD as controls are needed such as PE Therapy, and EMDR (Van Dam et al., 2018; Schrader and Ross, 2021). This would limit the risk of overstating the comparative superiority of the efficacy of the MBI. To illustrate this point, two recent comprehensive studies involving an SR and two meta-analyses with over 42,000 participants, Goldberg et al., (2018, 2022) found that the type of control used was a significant moderator of effects post-intervention, whereby the more specific and evidence-based the control, the lower the comparative effect of the MBI. Findings in this SR offer support for this conclusion, highlighting the need for future RCTs using stronger, evidence-based controls that are equally matched with interventions in terms of dosage and intensity.

### 5.3.3 Practice Duration and Follow-Ups

Findings on home practice were limited. While some studies reported a correlation between the amount of weekly practice and reductions in PTSD (Goldsmith et al., 2014; Kelly and Garland, 2016), others, such as Kimbrough and Magyari (2009) did not find any significant correlations with practice duration. Given that some research has shown a correlation between increased practice and symptom reduction, further research should examine practice duration

and intensity to identify the minimum amount, if any, required to contribute to sustained effects (Crane et al., 2014).

There were notable differences in follow-up periods, as noted in Chapter 4. Only one study involved a follow-up exceeding 6 months; Earley et al., (2014) conducted a 2.5-year follow-up to the Kimborough and Magayari (2009) study and discovered that MBSR resulted in significant and lasting improvements in PTSD and mindfulness. Whilst these results are positive, the original study was uncontrolled and had only 15 participants, all female, so results are caveated. Thus, more longitudinal studies with longer follow-up periods are needed to evaluate effects over time.

### 5.3.4 Teacher Competence

The role of the teacher is known to be significant in MBIs and their skills can influence whether participants experience adverse effects (Dobkin 2012; Crane & Kuyken, 2013; Crane et al., 2017; Treleaven, 2018; Wielgosz et al., 2019; Farias et al., 2020; Tang and Tang, 2020). The teachers in the studies were aware that all participants had PTSD, and most were trauma informed. In some cases, participants described the teacher as helpful whereas in others, participants felt the teacher did not provide enough support or make them feel secure (Müller-Engelmann et al., 2017). The additional presence of a PTSD therapist was noted to be very helpful. Therefore, future studies should do more to understand the potential influence on outcomes of teacher competence. Moreover, it is also important that the teachers in both intervention and control groups are equally skilled and enthusiastic (Goldman and Davidson, 2017).

## 5.4 Conclusion

Measuring the impact of various factors on clinical outcomes can be difficult due to the many variables involved, including nonspecific therapeutic elements like the Hawthorne effect (Frost et al., 2014). Therefore, it is important to exercise caution when generalising or making

substantive claims about results. For example, the benefits of social support in promoting recovery are well documented (Pickover et al., 2021). In the studies included in this SR, several participants acknowledged the value of peer support and group structure (Schure et al., 2018; Powers et al., 2023). Additionally, recognising that others experience similar symptoms may have helped participants become less judgmental of their inner experiences, potentially increasing this facet of mindfulness (Niles et al., 2013). However, given the numerous other variables at play, such as the type of MBI and population, the unknown extent of previous treatment, and different controls being used, more research is needed before any definitive conclusions about outcomes can be made.

# 6. CHAPTER 6: DISCUSSION ON SECONDARY OBJECTIVES

This chapter discusses the three secondary objectives of this dissertation:

(1) Are there specific components of mindfulness that are particularly effective in treating PTSD?
(2) Is there evidence of the respective neurobiological mechanisms involved?
(3) Is there evidence of aspects of the MBIs that may need to be adapted for this population?

The secondary questions' findings are significant as they offer a comprehensive and insightful understanding of the impact of MBIs on PTSD beyond just the quantitative results. Findings highlighted discrepancies, gaps, and other factors which need to be investigated, as well as areas that show promise in the use of MBIs for this disorder.

## 6.1 (1) Are there specific components of mindfulness that are particularly effective in treating PTSD?

### 6.1.1 General Mindfulness

Several positive themes emerged from the qualitative interviews which indicated improvements in general mindfulness tendencies. These contributed to a better understanding of how MBIs impact the lived experience of those with PTSD and are largely consistent with previous research which has indicated the potential mechanisms at work in MBIs (Boyd et al., 2018). Participants reported increased coping skills, including greater non-reactivity and detachment when handling difficult situations (Müller-Engelmann et al., 2017; Colgan et al., 2017; Schure et al., 2018; Powers et al., 2023). They also noticed increases in present-moment awareness, which helped them defuse unwanted thoughts and to live in the moment; "*taking one day at a time*", and "*learning how to live for today*" (Dutton et al., 2013; Schure et al., 2018). There was also a greater acceptance of adversity, with participants acknowledging the importance of "*allowing suffering to be part of experience*", and "*accepting that you're stressed out, that you're not feeling so happy*" (Dutton et al., 2013; Colgan et al., 2017; Schure

et al., 2018; Kang et al., 2022). Interestingly, some individuals expressed appreciation for not having to discuss the details of the trauma (Dutton et al., 2013; Powers et al., 2023). Furthermore, they reported feeling more in control, finding the practices "*strengthening*", suggesting increased agency and self-regulation (Müller-Engelmann et al., 2017; Colgan et al., 2017; Powers et al., 2023).

### 6.1.2 Facets of Mindfulness and PTSD

Chapter 2 presented the hypothesis that there is a connection between increasing facets of mindfulness and decreasing symptoms of PTSD. However, there is a lack of evidence on the causative links between the two. It is important to examine in some detail the findings on this matter from this SR as until these underlying mechanisms are identified, the ability to customise MBIs for the neural pathological requirements of PTSD will remain limited.

Mindfulness is commonly assessed using the Five Facet Mindfulness Questionnaire (FFMQ, Baer et al., 2008) and PTSD with the CAPS and PCL tools. The FFMQ assesses the five facets of "observing," "describing," "acting with awareness," "non-judging of inner experience," and "non-reactivity to inner experience." The PTSD symptom clusters are "intrusions (re-experiencing)", avoidance", "changes in mood and cognition", and "hyperarousal and reactivity" (APA 2013).

All of the primary studies in this SR reported either changes in mindfulness and/or changes in PTSD. However, most studies implied correlation but did not demonstrate it sufficiently for it to be considered empirical evidence. Therefore, it remains unclear which specific facets of mindfulness or symptoms of PTSD are most responsive to treatment. Also unclear is which facets may be directly responsible for changes in specific PTSD symptom clusters. For instance, Aizik-Reebs et al., (2021) reported that MBTR-R reduced "numbing"," re-experiencing" and "hyperarousal" symptoms of PTSD, yet no correlation with individual mindfulness facets was explored. Similarly, whereas Jasbi et al., (2018) reported superior reductions in all facets of PTSD with MBCT, they acknowledged the lack of insight into the underlying mechanisms of mindfulness and instead speculated on the specific attributes of MBCT responsible for the changes. Likewise, but from a contrasting position, Niles et al.,

(2013) found increases in the facets of “observing” and “describing” but did not investigate any correlation with the PTSD symptom clusters. Meanwhile, Müller-Engelmann et al., (2017) reported that a correlational analysis revealed a “trend” toward an association between an increase in mindfulness skills, especially “observing”, and an overall decrease in PTSD symptoms. However, further analysis of which specific clusters of PTSD were affected was not reported. This study therefore only tentatively suggests an inverse relationship between FFMQ scores and PTSD symptoms. Although findings from their qualitative interviews seemed to suggest support for these results, this trial was uncontrolled, so full attribution of the changes in mindfulness to the decreases in PTSD is questionable.

As interesting as the above findings are, they are not empirical evidence of any causal relationship between individual facets of mindfulness and associated changes in PTSD symptoms. This is a significant issue as it hinders claims of efficacy of MBIs. Furthermore, it is worth noting that control conditions can also affect these changes. The Davis et al., (2019) study found that both MBSR and PCGT brought about statistically significant improvements in FFMQ scores and PTSD scores, with PGCT having the same effect on FFMQ and PTSD scores as the MBI! This further illustrates the importance of quantifying the unique effects of validated control conditions as well as MBIs. Another significant case in point, Colgan et al., (2017) found that even with a non-active control of sitting quietly, 42% of participants reported improvements in PTSD symptoms. Yet, crucially, very few of them reported any increases in the mindfulness facets! Therefore, these findings show that it cannot be assumed or inappropriately concluded that the MBI is singularly responsible for any increases in facets of mindfulness or in facets of PTSD.

Only one study attempted to identify a direct correlation between the mindfulness facets and PTSD cluster symptoms. In a large secondary study with 113 veterans using MBSR, Stephenson et al., (2017) found that increases in the mindful skills of “non-reactivity” and “acting with awareness” were significantly associated with lower PTSD symptoms in all four clusters – “hyperarousal” (22%), “emotional numbing” (19.2%), “re-experiencing” (10.9%), and “avoidance” (6.6%). Unlike previous studies, which suggested that “nonjudgment” and “acting with awareness” may be facets uniquely related to reducing PTSD symptoms (Thompson & Waltz, 2010; Hozel et al., 2010; Vujanovic et al., 2011; Banks et al., 2015), this study revealed that changes in “nonjudgment” and “describing” facets of mindfulness were not

significantly associated with changes in PTSD severity. Nevertheless, the “acting with awareness” facet seems to be of common significance in these studies. Interestingly, and in contrast to Müller-Engelmann et al., (2017), increases in “observing” were sometimes associated with worsening PTSD symptoms, which, on the one hand, seems to support the view that mindfulness may be detrimental in some cases (Lambert et al., 2023). However, it must be noted that the re-experiencing of traumatic memories during MM, if handled appropriately under the guidance of a skilful teacher, may lead to improvements (Levine, 2010; Treleaven, 2018).

### 6.1.3 Role of Different Practices

Research has shown that different mindfulness practices can produce different results (Goldman and Davidson, 2018; Tang and Tang, 2020). Findings from this review would seem to support this. Studies conducted by Colgan et al., (2016; 2017) and Wahbeh et al., (2016) revealed that participants perceived improvements in mindfulness skills differently based on the practices they engaged in. For example, while both the Body Scan (BS) and Mindful Breathing (MB) groups reported increases in “present moment awareness”, participants in each group perceived the effects differently. The BS group reported more "awareness," "noticing," and "paying attention", whereas the MB group reported more "here and now" and “in the present”. Furthermore, these mindfulness skills were found to be associated with a reduction in different aspects of PTSD, such as physiological arousal and reactivity in the BS group and rumination in the MB group. This study highlights the complexity of identifying the specific components of interventions responsible for producing certain effects for specific individuals (Colgan et al., 2017). These findings are consistent with the views of Sauer-Zavala et al., (2013), Stephenson et al., (2017), and Raffi et al., (2019), who suggested that the overall positive effects of MBIs on PTSD may be through the holistic and synergetic power of the combination of the facets and practices working together.

## 6.2 (2) Is there evidence of the respective neurobiological mechanisms involved?

As noted in Chapter 2, while the exact underlying neurobiological mechanisms of action in PTSD are still unknown, certain brain areas are known to be impaired (Goleman and Davidson, 2018). Only three studies in this SR examined the neural mechanisms involved; however, consistent with the literature, the findings show promise regarding increasing evidence of the neurobiological mechanisms involved with MBIs.

Bremner et al., (2017) used PET scans to examine brain imaging pre and post-treatment and found that MBSR positively affected areas of the brain known to be impaired in PTSD. Specifically, they observed increased function in the ACC and the inferior parietal lobule, and decreased function in the insula and praecuneus. These brain areas play a crucial role in regulating stress and the extinction of fear responses (Shalev et al., 2017; Tang and Tang, 2020).

Another study by King et al., (2016) used fMRI scans to assess brain responses to fearful and angry cues pre and post-treatment. Both groups in the study were found to be equally effective at reducing PTSD symptoms, but interestingly, only the MBET group showed larger changes in brain areas known to be hyper- or hypoactive in PTSD, showing increased activity in the ACC, the mPFC, and the left amygdala. Furthermore, participants who reported greater improvements in PTSD symptoms also showed larger increases in these brain areas, indicating a correlative association. Notably, the study found that increased activity in the amygdala, which is typically too active in individuals with PTSD, correlated with reduced PTSD symptoms. Although increased amygdala activity would appear to be detrimental, the authors suggested that, in this case, it may be indicative of a more normalised response to fearful emotional cues, hypothesising that the ability to engage more and avoid less signified an improvement in emotion regulation.

Finally, Kang et al., (2022), a secondary study of the Polusny et al., (2015) dataset, found that MBSR significantly enhanced multiple cerebral functions when compared to the PCGT control. The study used EEG measures to record neural activity pre and post-treatment and found that MBSR improved brain activity, cognitive task–related brain responses, and interoceptive brain responses. These findings may be significant as these neural processes are thought to enhance interoceptive brain function (Tang and Tang, 2020). The results of this study provide further insights into what may be the comparatively superior therapeutic benefits

of MBSR. Like Colgan et al., (2017) and Raffi et al., (2019), the authors recommended more advanced studies of similar design to further pinpoint the unique mechanisms of specific practices.

### 6.2.1 Neuroendocrine and Immune Biomarkers

Typically, PTSD severity has been inversely associated with low basal awakening cortisol levels due to dysfunctional HPA axis activity (Rauch et al., 2020). Shapira et al., (2022) pooled biomarkers from Polusny et al., (2015) and Davis et al., (2019), and found that consistent with previous studies, lower baseline cortisol was associated with more severe self-reported PTSD symptoms. Furthermore, increased mindfulness was associated with increased morning cortisol, with the greatest improvements in those with lower baseline cortisol and more severe PTSD. Furthermore, Bishop et al (2018) found that MBSR in veterans changed genes (methylation of FKBP5) which regulate HPA axis function, improving the stress response in those with PTSD. These findings indicate the value of assessing neuroendocrine and immune biomarkers in studies with MBIs and controls.

## 6.3 (3) Is there evidence of aspects of the MBIs that may need to be adapted for this population?

This section looks at how well the MBIs were tolerated, examining dropout rates, adverse effects, and trauma-sensitive modifications.

### 6.3.1 Dropout Rates

Dropout rates varied among studies and were calculated differently, depending on the completion rate used. Dropout rates varied from high at 30%+ (Earley et al., 2014; Davis et al., 2015; Müller-Engelmann et al., 2017; Gallegos et al., 2020; Aizik-Reebes et al., 2021) to medium at 20%-30% (Niles et al., 2012; Dumarkite et al., 2021) to low at 0-20% (Polusny et

al., 2015; Kelly and Garland, 2016; Powers et al., 2023). Dropout rates were zero in both Jasbi et al., (2018) and Liu et al., (2022). Compared to the pooled rates of dropout from RCTs of psychological therapies for PTSD (16%) (Lewis et al., 2020), the dropout rates in the studies in this SR are high. There were many reasons for participants dropping out, some of which were not related to the intervention. Additionally, in most of the studies, no significant differences in characteristics were found between those who dropped out and the completers. Future research should try to establish the reasons for these high dropout rates.

### 6.3.2 Adverse Effects

A recent review of MM studies revealed that AEs were prevalent in 8.3% of cases, although the authors acknowledged that the actual figure could be higher (Farias et al., 2021). As MM may trigger traumatic symptoms, caution is required when working with those with PTSD (Banks et al., 2015; Van Dam et al., 2018; Treleaven, 2018; Gibson, 2019; Baer et al., 2019; Britton et al. 2021). Some studies did not contain any information on AEs, so it is not known if any were experienced (Kelly and Garland, 2016; Bremner et al., 2017; King et al., 2016, Gallegos et al., 2020; Dumarkaite et al., 2021; Liu and Qin, 2021, Liu et al., 2022). This is concerning, especially in studies with vulnerable participants. Moreover, the lack of assessment and/or reporting on AEs in studies of MBIs is not only unethical but may have led to their underreporting and the incorrect conclusion that MBIs are free of them (Van Dam et al, 2018; Britton et al., 2021; Farias et al., 2021).

Three studies reported that no AEs to treatment occurred during the intervention (Niles et al., 2012; Kimbrough and Magyari, 2009, Aizik-Reebes et al., 2021). However, this claim may be misleading as one study, Niles et al., (2012), reported that psychoeducation may "*be harmful to some individuals*" after a few veterans in that control group had clinically significant worsening of symptoms. This finding emphasises the importance of creating and implementing standardised definitions and assessments of AEs for use in RCTs, an issue still under discussion, as opposed to each study using its own (Faris et al., 2021).

In the studies that documented AEs, participants reported experiencing a variety of challenges. For some, the beginning of the intervention appeared to be overwhelming, with descriptions of

it being "*incredibly difficult*" with feelings of "*overextension, exhaustion and desperateness*" (Müller-Engelmann et al., 2017). Another participant reported dissociating during sessions and experiencing difficulties with the body scan, which "*triggered panic attacks*" (Dutton et al., 2013). One participant experienced clinically significant increases in depression symptoms, with levels returning to baseline levels at follow-up (Aizik-Reebes et al., 2021). Several serious psychiatric events were also reported. One study reported two participants being admitted to inpatient psychiatric care due to worsening PTSD symptoms, though one remained in the study (Kearney et al., 2013). In another study, four participants, three in the MBSR group, were hospitalised for suicidal ideation, but the authors asserted these were unrelated to the intervention (Davis et al., 2019). Furthermore, one participant in the PCGT group of the Polusny et al., (2015) study made a suicide attempt.

### 6.3.3 Modifications to MBIs

As standard MBIs have previously not been recommended for those with PTSD (Lustyk et al., 2009; Dobkin et al., 2012; Van Dam et al., 2018; Zhu et al., 2019), several MBIs were adapted to meet the needs of participants. Some included trauma-specific psychoeducation on the emotional and physiological effects of trauma (Dutton et al., 2013, Kelly and Garland, 2016, Aizik-Reebs et al., 2021). This was done to provide insight into, and to normalise, the PTSD experience, and to encourage agency and self-empowerment. Participants were taught to use mindful breathing or the body scan to modulate dissociative or arousal responses when they recognised they were going outside their window of tolerance (Kelly and Garland, 2016). Changes were also made to prioritise an enhanced sense of safety in participants such as using trauma-sensitive language (Kimborough and Magyari, 2009), practising a "safe place" early on, and including self-compassion-based practices (Aizik-Reebs et al., 2021). Sociocultural sensitive adaptions were also added in Aizik-Reebs et al., (2021). Of note is that of the three studies which reported the absence of AEs during treatment, two were modified MBIs (Kimbrough and Magyari, 2009, Aizik-Reebes et al., 2021). Notwithstanding, some participants in the adapted MBIs still faced challenges such as panic attacks and expressed the

need for more support with issues such as difficult feelings related to traumatic memories (Dutton et al., 2013).

Only one of the adapted MBIs involved veterans (King et al., 2016). It is unclear why this may be so. Kearney et al., (2013) used MBSR without modification because they felt that veterans would be able to titrate their experience, given that many would have had previous education about and/or treatment for PTSD (Vujanovic et al., 2011). Nevertheless, Kearney et al., (2013) and Goldberg et al (2020) suggested that tailored MBIs targeting nuances of PTSD for veterans should be explored.

# 7. CHAPTER 7: IMPLICATIONS AND FUTURE DIRECTIONS

In addition to the recommendations outlined in Chapters 5 and 6 about future directions of research, recommendations on several significant issues relating to methodological issues and research gaps are presented as follows:

## 7.1 Research Gaps

### 7.1.1 The Underpinning Causal Mechanisms of Action

Priority needs to be given to work that focuses on elucidating the individual facets of mindfulness that correlate with changes in PTSD symptoms. As outlined in Chapter 6, while there are indications of a potential relationship between the two, claims of causative links in the studies are widely unsubstantiated. Without this evidence, much remains unclear, and it is difficult to know what is working, what is not, why, and for whom. As difficult an exercise as it may be, it is recommended that future RCTs are designed to try to identify these links to fully understand the unique and superior benefits, if any, of MBIs. Furthermore, as identified in Section 6.1.2, work is also needed to identify the individual facets and benefits of different practices in MBIs to pave the way for more focused treatments.

### 7.1.2 The Importance of Longitudinal, Multi Method Approaches

The findings of this SR support the view of Cohen et al., (2018, p. 18) that '*phenomena do not speak for themselves, and observation alone is not sufficient to denote meaning*' as there were discrepancies in the results from different methods used. Francisco Varela's work on the need for the sciences of mind to incorporate the first person lived experience, his "embodied cognition" approach, also resonates here (Valera et al., 2016). For instance, the quantitative findings in Colgan et al., (2016) were incongruent with the subjective experiences and improvements felt by participants in the qualitative analysis (Colgan et al., 2017). One possible

explanation for this is that some participants may have felt better able to cope with symptoms even though the symptoms themselves had not reduced. However, it suggests that RCTs are limited in providing a comprehensive insight into the effects of an intervention, with results perhaps not being a true reflection of the actual meaningful effects that have taken place. In Kang et al., (2022), measures of neural outcomes demonstrated superior improvements in multiple cerebral functions of the MBSR group when compared to the PCGT control, yet the quantitative outcomes showed no statistical differences between the groups. Questions therefore remain regarding the meaning of the findings from each method. It may be the case that quantitative results and brain changes do not translate into the lived experience of some suffering with PTSD. Alternatively, some changes may simply take more time to manifest; for example, Niles et al., (2013) found that the skill of mindful nonjudging improved over time and may have continued to do so had the intervention been longer. In any event, these findings indicate the importance of using multi method approaches to assess the true benefits of an intervention, using outcomes from singular methods as indicative only. Finally, extended follow ups are recommended to assess longitudinal changes as previous research has indicated that longer meditation duration may be linked to greater improvement in PTSD symptoms (Hopwood and Schutte, 2017).

### 7.1.3 Do No Harm

The most important implication of this SR is the concern around the safety of participants. The bottom line is that the ethical obligation to do no harm must come first. Although the studies were well tolerated by some, dropout rates were high, and the experience of AEs was not uncommon, some of which were serious.

Given the degree of nervous system dysfunction and the low window of tolerance found in those with PTSD, it is recommended that MBIs be modified for this population. Emphasis needs to be placed on practices and tools that cultivate safety and the skills of containment so that participants can learn to stabilise symptoms before engaging in extended mindfulness practises (Vujanovic et al., 2011; Wästlund et al., 2023). With this in mind, serious consideration should therefore be given to the following suggestions:

- giving psychoeducation on PTSD which has been found to be a key mechanism of change, normalising the experience and providing participants with a sense of agency and hope (Wästlund et al., 2023);
- keeping eyes open during meditations or sitting rather than lying down during the body scan (Dutton et al 2013);
- shorter practices for those experiencing concentration and attention issues (Müller-Engelmann et al., 2017);
- changing sequence of practices (Dutton et al., 2013);
- minimisation of periods of long silences, especially for those who may lack the regulatory skills to manage acute distress (Vujanovic et al.,, 2011; Zhu et al., 2019);
- more guidance on the exercises in advance, such as knowing the duration and structure of the sessions (Müller-Engelmann et al., 2017); and
- informing participants that practices may be challenging and providing support and stabilisation tools for how to respond when challenges arise (Crane and Williams, 2010; Vujanovic et al., 2011; Dobkin et al., 2012).

Adapting MBIs would prioritise the safety of participants and may go some way towards alleviating the substantial barriers and resistance to engaging in treatment found in traumatised individuals with significant psychopathology (Powers et al., 2023). However, with the best of intentions, even modified practices can be harmful if not done mindfully (Dobkins et al., 2012; Zhu et al., 2019). Therefore, modified MBIs must be thoroughly assessed for feasibility and acceptability before implementation (Van Dam et al., 2018). Trauma-informed care also recognises the importance of the experience, insight and competence of the teacher, a role that carries much responsibility in minimising harm, as outlined in Section 5.3.4.

### 7.1.4 Compassion

The main limitation of this SR is that it did not explore the benefits of loving kindness (LK) and compassion practices in interventions. Although there are several MBIs focusing primarily on these practices, the scope of this SR was focused on more traditional MBIs. Although compassion is implicit to meditation practices, future studies should evaluate the value of increased emphasis on these practices in MBIs (Van der Brink and Koster, 2015, 2021). They may assist in enhancing safety and in coping with fear, self-judgment, and shame, common in those with PTSD (Kearney, 2015). However, as some individuals find such practices difficult, it is important to carefully consider the needs of the group before introducing them (Van den Brink & Koster, 2015; Luo et al., 2021).

### 7.2 Dissemination Plan

This dissertation will be placed in the University of Aberdeen library.

I will seek to get these findings published and intend to modify the information, as appropriate, depending on the outlet in question.

# 8. CHAPTER 8: CONCLUSION AND REFLECTION

This SR was very worthwhile in helping me to gain an understanding of the available evidence in the field, and to answer my research questions (Poklepović Peričić and Tanveer, 2019). In the process, much more has unfolded. Not unlike a meditation practice, the process revealed much about myself, including tendencies of perfectionism, pushing and achieving. However, along the way, it became much more than an academic exercise; with a deeper understanding of the nervous system, I started using more somatic meditation practices, which have become a daily habit. I have become more embodied as a result, becoming familiar with my own window of tolerance, and much more attuned to the types of things that overload it. Significantly, I no longer fear this, as I have the knowledge and tools to work with it, sustaining resources for which I am truly grateful.

I have always been a fixer, and my journey with mindfulness has taught me that I don't need to do this. Yet, resisting this compulsive urge "to do" is not easy! Reading the qualitative interviews, I was reminded once again of the essential essence of mindfulness; that even though PTSD, like many things, cannot be fixed or cured, healing is still possible. Participants' experiences provided insight into the importance of allowing space around that which is distressing, and for allowing inherent wisdom to emerge. I am consoled by the knowledge that even in the midst of terrible traumatic suffering, there is still a path, a portal into something transformative.

Though much work needs to be done, I am as fascinated, and even more inspired, than ever. I hope to continue to contribute to the growing body of research on the role of mindfulness with traumatic stress. Through it all though, I remain a student, of mindfulness, and of all that I learn from others. On this note, I would like to conclude with some of my favourite words..

*Out beyond ideas of wrongdoing and rightdoing,*

*there is a field. I'll meet you there.*

*When the soul lies down in that grass,*

*the world is too full to talk about.*

*Ideas, language even the phrase each other*

*doesn't make any sense.*

RUMI, from The Essential Rumi (1995)

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# APPENDICES

## Appendix 1: Ethical Approval Form

**Committee for Research Ethics & Governance in**

**Arts, Social Sciences & Business**

**Application Form for Ethical Approval of Research for**

**Undergraduate & Postgraduate Taught Research Projects**[1]

**Project details**

**Title of Project: Working Title:** Calming the autonomic storm: What can a Mindfulness-Based Intervention do for a dysfunctional autonomic nervous system.

**Name of Principal Investigator: Jacqueline Moore**

**Project Start Date: 14/11/2022**

**Additional Research staff (if applicable):**

**Recruitment procedures**

**IMPORTANT NOTE:**

The University has a duty to safeguard all children[2] and vulnerable (protected) adults at risk[3], including visitors attending University events; potential students met off-campus; students, staff and volunteers who are part of the University; or others who come into contact with University staff, representatives, or students in the course of their work.

If your research involves any of the above-mentioned groups, please provide the following confirmation:
*I will comply with the requirements of the* ***University's Safeguarding Policy*****.**
**Please tick the box to confirm ☐ N?A**

| | | Yes | No | N/A |
|---|---|---|---|---|
| **1** | Does your research activity involve persons less than 18 years of age? If yes, please provide further information below. | | **X** | |
| | | | | |

| | | Yes | No | N/A |
|---|---|---|---|---|
| **2** | Does your research activity involve people with learning or communication difficulties? (**Note:** all research involving participants for | | **X** | |

[1] Applications for ethical approval of staff and PGR research projects should be submitted using the online application process

[2] See Safeguarding Policy, Appendix, section 1.3
[3] See Safeguarding Policy, Appendix, section 1.2

| | | Yes | No | N/A |
|---|---|---|---|---|
| | whom provision is made under the Mental Capacity Act 2005 must be ethically reviewed by NHS NRES). If yes, please provide further information below. | | | |
| | | | | |

| | | Yes | No | N/A |
|---|---|---|---|---|
| **3** | Is your research activity likely to involve people involved in illegal activities? If yes, please provide further information below. | | **X** | |
| | | | | |

| | | Yes | No | N/A |
|---|---|---|---|---|
| **4** | Does your research activity involve people belonging to a vulnerable group, other than those noted above? If yes, please provide further information below. | | **X** | |
| | | | | |

| | | Yes | No | N/A |
|---|---|---|---|---|
| **5** | Does your research activity involve people who are, or are likely to become your clients or clients of the section in which you work? If yes, please provide further information below. | | **X** | |
| | | | | |

| | | Yes | No | N/A |
|---|---|---|---|---|
| **6** | Does your research activity provide for people for whom English is not their first language? If yes, please provide further information below on how this support will be provided, or if it will not be provided, please explain why not. | | **X** | |
| | | | | |

| | | Yes | No | N/A |
|---|---|---|---|---|
| **7** | Does your research activity require access to personal information about participants from other parties (e.g. teachers, employers), databanks or files? If yes, please explain below how you will ensure that use of this data complies with data protection legislation. | | **X** | |
| | | | | |

| | | Yes | No | N/A |
|---|---|---|---|---|
| **8** | Do you plan to conceal your own identity during the course of the research activity? If yes, please provide further information below (e.g. that this is necessary for the nature of the research, whether subjects will be contacted directly after the period of observation). | | **X** | |
| | | | | |

**Consent Procedures**

| | |
|---|---|
| **9** | Please provide details below of the consent procedures that you intend to use for obtaining informed consent from all subjects (including parental consent for children). You should provide details of how you will let subjects know that participation is voluntary and that they can withdraw at any time. You should also provide details of the processes for giving potential subjects adequate time for considering participation and for obtaining written consent. If research is observational, please advise how subjects will provide consent for |

| | |
|---|---|
| | being observed. If any of these issues are not applicable to your research or if you do not intend to address them for reasons of research methodology, please provide further information. |
| **Not Applicable as my research does not involve interaction with any subjects.** | |

**Possible Harm to Researchers/Participants**

| | | Yes | No | N/A |
|---|---|---|---|---|
| **10** | Are there any safety issues for you in conducting this research? If so, please provide details below of what these might be and how you intend to address such issues. | | **X** | |
| | | | | |

| | | Yes | No | N/A |
|---|---|---|---|---|
| **11** | Is there any realistic risk of any subjects experiencing either physical or psychological discomfort or distress? Or any realistic risk of them experiencing a detriment to their interests as a result of participation? If so, please provide details below of what this might be and how you intend to address such issues. | | **X** | |
| | | | | |

**Data Protection and Security**

**IMPORTANT NOTE:**

The General Data Protection Regulation imposes a number of obligations for the use of **personal data** (defined as any information relating to an identified or identifiable living person) or including the use of personal data in research.

If you are using personal data, you should consider whether your research requires a Data Protection Impact Assessment and complies with the University Data Protection policy.

If you are, you now need to see the Data Protection Checklist for Researchers[4] for guidance.

If you then feel that a DPIA may be required or you need data protection advice, then you should contact the Data Protection Officer dpa@abdn.ac.uk.

Please provide the following confirmation:

*I have read the above guidance and have met the relevant data protection obligations.*

☑ **Please tick the box to confirm**

**In addition,** you should also check the requirements for a Data Management Plan (DMP) in the Research Data Management Policy and Guidance.

[4] Click on 'Guides' to find the checklist

**Once checked, please confirm the requirement by ticking one of the following:**

***X No requirement for DMP***

☐ ***DMP required and this is attached***

Please see here for guidance on creating a DMP. For further support, contact digitalresearch@abdn.ac.uk

| | |
|---|---|
| **12** | Please provide details below of how you intend to ensure that data is stored securely and in line with the requirements of the Data Protection Act and the General Data Protection Regulations. Please refer to the University's Data Protection guidance for researchers, and in particular, the Data Protection checklist for researchers.<br><br>Please give specific consideration to whether any non-anonymised and/or personalised data will be generated and/or stored and what precautions you will put in place regarding access you might have to documents containing sensitive data about living individuals **that is not publicly available elsewhere**? If your research relates to the latter, please consider the consent of the subjects including instances where consent is not sought. |

**I am familiar with the requirements around the storage and use of personal data in accordance with the university's Data Protection guidance, the Data Protection Act and the General Data Protection Regulation (GDPR). However, I am not using (accessing, collecting, analysing or storing) any personal or sensitive data as part of my research project.**

**IMPORTANT NOTE:**
Please confirm if your research requires you to **travel outwith the UK?** **X NO**

**If YES**, please provide the following confirmation:

*I will comply with the requirements of the **University's Overseas Travel Policy**, including obtaining permission to travel (where required by the policy), completion of a **risk assessment** and will obtain **University travel insurance cover**.*

**Please tick the box to confirm ☐**

**It is the responsibility of all researchers to ensure that they follow the University's various policies designed to ensure good research practice.** This includes providing appropriate participant information sheets and consent forms and ensuring confidentiality in the storage and use of data. Any significant change in the question, design or conduct over the course of the research activity should be notified to your School Research Ethics Officer and will require a new application for ethics approval.

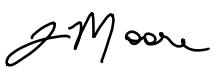
**Please attach the following to this form:**

- **Full proposal of relevant research project.** In order to speed up the process of review, applicants are advised to pay particular attention to those areas for which a 'Yes' has been ticked in the following form, either by providing an account of the procedures or training to be employed to ensure ethical practice, or an academic justification for the research strategy employed (or both).
- **Participant information sheet and consent form (where appropriate).** Please note that the Participant information sheet must include a weblink to the **'Privacy Notice for Research Participants'.**

**Applicant Name: Jacqueline Moore**

| | |
|---|---|
| **Signature** | **Jacqueline Moore** |
| **Date** | **09/11/2022** |

I declare that the above Ethical Approval form was submitted along with my full proposal in November 2022, at the commencement of this project.

Signed:  Date: 17th August 2023

## Appendix 2: PTSD – Criteria for Diagnosis

### American Psychiatric Association - DSM-5 - May 2013.

### Criterion A: Stressor

The person was exposed to: death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence, as follows: (one required)

1. Direct exposure.
2. Witnessing, in person.
3. Indirectly, by learning that a close relative or close friend was exposed to trauma. If the event involved actual or threatened death, it must have been violent or accidental.
4. Repeated or extreme indirect exposure to aversive details of the event(s), usually in the course of professional duties (e.g., first responders, collecting body parts; professionals repeatedly exposed to details of child abuse). This does not include indirect non-professional exposure through electronic media, television, movies, or pictures.

### Criterion B: Intrusion symptoms

The traumatic event is persistently re-experienced in the following way(s): (one required)

1. Recurrent, involuntary, and intrusive memories. Note: Children older than six may express this symptom in repetitive play.
2. Traumatic nightmares. Note: Children may have frightening dreams without content related to the trauma(s).
3. Dissociative reactions (e.g., flashbacks) which may occur on a continuum from brief episodes to complete loss of consciousness. Note: Children may reenact the event in play.
4. Intense or prolonged distress after exposure to traumatic reminders.
5.Marked physiologic reactivity after exposure to trauma-related stimuli.

### Criterion C: Avoidance

Persistent effortful avoidance of distressing trauma-related stimuli after the event: (one required)

1.Trauma-related thoughts or feelings.
2.Trauma-related external reminders (e.g., people, places, conversations, activities, objects, or situations).

### Criterion D: Negative alterations in cognitions and mood

Negative alterations in cognitions and mood that began or worsened after the traumatic event: (two required)

1. Inability to recall key features of the traumatic event (usually dissociative amnesia; not due to head injury, alcohol, or drugs).
2. Persistent (and often distorted) negative beliefs and expectations about oneself or the world (e.g., "I am bad," "The world is completely dangerous").
3. Persistent distorted blame of self or others for causing the traumatic event or for resulting consequences.
4. Persistent negative trauma-related emotions (e.g., fear, horror, anger, guilt, or shame).
5. Markedly diminished interest in (pre-traumatic) significant activities.
6. Feeling alienated from others (e.g., detachment or estrangement).
7.Constricted affect: persistent inability to experience positive emotions.

**Criterion E: Alterations in arousal and reactivity**

Trauma-related alterations in arousal and reactivity that began or worsened after the traumatic event: (two required)

1. Irritable or aggressive behaviour
2. Self-destructive or reckless behaviour
3. Hypervigilance
4. Exaggerated startle response
5. Problems in concentration
6. Sleep disturbance

**Criterion F: Duration**

Persistence of symptoms (in Criteria B, C, D, and E) for more than one month.

**Criterion G: Functional significance**

Significant symptom-related distress or functional impairment (e.g., social, occupational).

**Criterion H: Exclusion**

Disturbance is not due to medication, substance use, or other illness.

**Specify if: With dissociative symptoms.**

In addition to meeting criteria for diagnosis, an individual experiences high levels of either of the following in reaction to trauma-related stimuli:

1. Depersonalization: experience of being an outside observer of or detached from oneself (e.g., feeling as if "this is not happening to me" or one were in a dream).

2. Derealization: experience of unreality, distance, or distortion (e.g., "things are not real").

**Specify if: With delayed expression.**

Full diagnosis is not met until at least six months after the trauma(s), although onset of symptoms may occur immediately.

**World Health Organisation – ICD – 11 – Jan 2022**

**Description**

Post traumatic stress disorder (PTSD) may develop following exposure to an extremely threatening or horrific event or series of events.

**Essential (Required) Features:**

Exposure to an event or situation (either short- or long-lasting) of an extremely threatening or horrific nature. Such events include, but are not limited to, directly experiencing natural or human-made disasters, combat, serious accidents, torture, sexual violence, terrorism, assault or acute life-threatening illness (e.g., a heart attack); witnessing the threatened or actual injury or death of others in a sudden, unexpected, or violent manner; and learning about the sudden, unexpected or violent death of a loved one.

Following the traumatic event or situation, the development of a characteristic syndrome lasting for at least several weeks, consisting of all three core elements:

1) re-experiencing the traumatic event or events in the present in the form of vivid intrusive memories, flashbacks, or nightmares. Re-experiencing may occur via one or multiple sensory modalities and is typically accompanied by strong or overwhelming emotions, particularly fear or horror, and strong physical sensations;

2) avoidance of thoughts and memories of the event or events, or avoidance of activities, situations, or people reminiscent of the event(s); and

3) persistent perceptions of heightened current threat, for example as indicated by hypervigilance or an enhanced startle reaction to stimuli such as unexpected noises. The symptoms persist for at least several weeks and cause significant impairment in personal, family, social, educational, occupational or other important areas of functioning.

The disturbance results in significant impairment in personal, family, social, educational, occupational or other important areas of functioning. If functioning is maintained, it is only through significant additional effort.

**Additional Clinical Features:**

Common symptomatic presentations of Post-Traumatic Stress Disorder may also include general dysphoria, dissociative symptoms, somatic complaints, suicidal ideation and behaviour, social withdrawal, excessive alcohol or drug use to avoid re-experiencing or manage emotional reactions, anxiety symptoms including panic, and obsessions or compulsions in response to memories or reminders of the trauma.

The emotional experience of individuals with Post-Traumatic Stress Disorder commonly includes anger, shame, sadness, humiliation, or guilt, including survivor guilt.

**Boundary with Normality (Threshold):**

A history of exposure to an event or situation of an extremely threatening or horrific nature does not in itself indicate the presence of Post-Traumatic Stress Disorder. Many people experience such stressors without developing a disorder. Rather, the presentation must meet all diagnostic requirements for the disorder.

**Course Features:**

- Onset of Post-Traumatic Stress Disorder can occur at any time during the life span following exposure to a traumatic event.
- Onset of Post-Traumatic Stress Disorder symptoms typically occurs within three months following exposure to a traumatic event. However, delays in the expression of Post-Traumatic Stress Disorder symptomology can occur even years after exposure to a traumatic event.
- The symptoms and course of Post-Traumatic Stress Disorder can vary significantly over time and individuals. Recurrence of symptoms may occur after to exposure to reminders of the traumatic event or as a result of experiencing additional life stressors or traumatic events. Some individuals diagnosed with Post-Traumatic Stress Disorder can experience persistent symptoms for months or years without reprieve.
- Nearly one half of individuals diagnosed with Post-Traumatic Stress Disorder will experience complete recovery of symptoms within 3 months of onset.

*References*

*1. American Psychiatric Association. (2013) Diagnostic and statistical manual of mental disorders, (5th ed.). Washington, DC: Author.*
*2. World Health Organisation (WHO) (2022)*

## Appendix 3: Table 1: PTSD Symptom Clusters

| Cluster | Specific Symptoms |
|---|---|
| **Intrusion** | Involuntary and intrusive distressing memories<br>Traumatic nightmares<br>PTSD (dissociative) flashbacks<br>Trauma-related, stimulus-evoked psychological distress<br>Trauma-related, stimulus-evoked physiological reactions |
| **Persistent Avoidance** | Avoiding trauma-related thoughts and feelings<br>Avoiding trauma-related activities, places, and people |
| **Negative Cognitions and Mood** | Amnesia for trauma-related memories<br>Negative beliefs and expectations about oneself, others or the world<br>Distorted cognitions about causes & consequences of the trauma<br>Persistent negative emotional state<br>Diminished interest<br>Feeling detached or estranged<br>Inability to experience positive emotions |
| **Alterations in Arousal and Reactivity** | Irritable behaviour and angry outbursts<br>Reckless or self-destructive behaviour<br>Hypervigilance<br>Exaggerated startle response<br>Problems with concentration<br>Sleep disturbance |

**Source: Friedman (2015)**

**Appendix 4: Table 2: Brain Networks involved in PTSD.**

| - | Default Mode Network (DMN) | Central Executive Network (CEN) | Salience Network (SN) |
|---|---|---|---|
| Core structures | mPFC, PCC, precuneus[1], medial temporal lobe (including hippocampus) | dlPFC, precuneus, anterior inferior parietal lobule, and part of premotor cortex | dACC, amygdala, insula |
| Core functions | Self-referential and emotional processing, recollection of prior experiences[2], default or habitual responses, mentalization and abstract mental state processing[3] | Inhibitory control, emotion regulation, attention regulation | Attention regulation, determining importance of stimuli, regulating other networks |
| Associated PTSD symptoms | Intrusive symptoms (diminished ability to maintain a calm inner state), altered sense of self or reality (dissociation), avoidance (generalization of fear) | Cognitive deficits, loss of SN regulation. Reduced working memory and emotional control | Hypersensitive threat detection |
| Circuit alteration found in PTSD | Decreased activity and intrinsic connectivity | Decreased activity and intrinsic connectivity. PTSD-DS shows increased connectivity within CEN | Increased activity and intrinsic connectivity; Hyperconnectivity between SN and DMN[4]; impaired DMN and CEN modulation by SN |

**Note:** (Based on Kamiya *et al.* (2020) [208], Akiki *et al.* (2017) [235] and Raichle (2015) [236]).
[1][236, 237], [2][236, 238], [3][239], [4][240].
***Abbreviations*:** CEN, central executive network; dACC, dorsal anterior cingulate cortex; dlPFC, dorsolateral prefrontal cortex; DMN, default mode network; mPFC, medial prefrontal cortex; PTSD, posttraumatic stress disorder; PTSD-DS, dissociative subtype of PTSD; PCC, posterior cingulate cortex, SN, salience network.

**Source: Burback et al., (2023) P.11**

**Appendix 5: Table 3: Brain Areas impacted in PTSD and the Hypothesised Effects of the Mechanisms of Mindfulness on same.**

| Areas of Brain | Responsible for: | Alterations to Brain Function in PTSD | Consequences of Neural Alterations | PTSD Symptom Clusters | Mindfulness Mechanisms | Hypothesised Effect on PTSD |
|---|---|---|---|---|---|---|
| **Amygdala** | Fear learning and conditioning.<br>Fear extinction.<br>Emotional content of memory.<br>Pain processing.<br>Regulates stress response. | Hyperactive. | Heightened emotional reactivity.<br>Inappropriate fear responses.<br>Aggressive behaviour.<br>Disrupted sleep.<br>Increased pain sensitivity. | Intrusions.<br>Avoidance.<br>Changes in mood and cognition.<br>Hyperarousal and reactivity. | Open acceptance.<br>Present moment awareness.<br>Attentional control.<br>Attitudes of curiosity and non-judgement.<br>Metacognitive awareness. | Mediates hyperarousal of amygdala.<br>Stabilises window of tolerance.<br>Deconditions the fear conditioned response.<br>Increases emotion regulation, and self-awareness. |
| **Prefrontal cortex (PFC)** | Higher order cognitive processes.<br>Emotional processing.<br>Regulation of autonomic arousal.<br>Modulates fear response of Amygdala. | Hypoactive. | Impaired Amygdala Inhibition<br>Impaired cognition<br>Poor concentration<br>Emotional dysfunction<br>Aggression, irritability<br>Increased fear responses<br>Impaired extinction of trauma reminders | Intrusions.<br>Avoidance.<br>Changes in mood and cognition.<br>Hyperarousal and reactivity. | Present moment awareness.<br>Intentional regulation of attention.<br>Attitudinal skills of observing, describing, acting with awareness, non-judging, and non-reactivity | Strengthens PFC.<br>Increased attention control and self-regulation.<br>Cognitive flexibility, and memory specificity.<br>Decentring may reduce avoidance, hyperarousal, and dissociation |
| **Hippocampus** | Memory and learning processes.<br>Regulating emotion and stress response. | Hypoactive. | Memory issues, intrusive images, flashbacks.<br>Poor emotional processing and regulation of stress response. | Intrusions.<br>Hyperarousal and reactivity. | Present moment awareness.<br>Intentional regulation of attention.<br>Attitudinal skills of observing, describing, acting with awareness, non-judging, and non-reactivity. | May reduce avoidance, rumination, emotional numbing and dissociation.<br>May reduce negative emotions such as shame and guilt.<br>Better able to regulate arousal and the stress response.<br>Improved memory specificity<br>Greater ability to inhibit the limbic system. |

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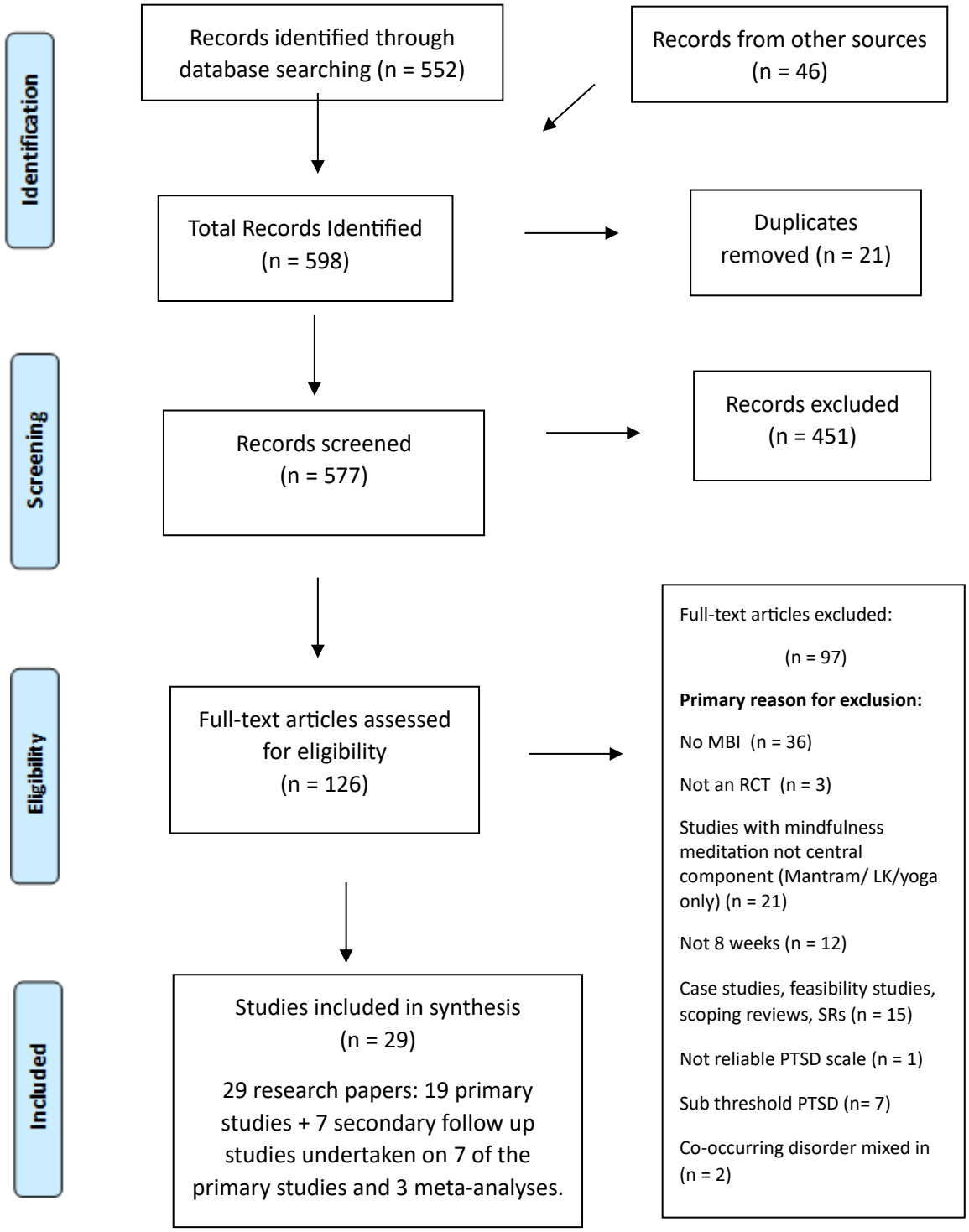
| **Insula** | Interoceptive centre in the brain.<br>Metamemory function.<br>Cognitive awareness<br>Attention.<br>Fear processing. | Hypoactive. | Maladaptive forms of interoceptive awareness.<br>Hypervigilance.<br>Poor emotional regulation.<br>Impaired memory function. | Intrusions.<br>Hyperarousal and reactivity. | Present moment awareness.<br>Attentional control.<br>Attitudinal skills foster acceptance, non-reactivity to experience like body sensations, feelings, emotions.<br>Metacognitive awareness. | Increased embodiment.<br>Enhanced interoceptive brain function.<br>May counter avoidance and dissociative tendencies.<br>Increased self-control.<br>Increased cognitive flexibility.<br>Meta awareness. |
| **Dorsal Anterior Cingulate Cortex (dACC)** | Self-control.<br>Cognitive processes.<br>Attention, emotion and arousal regulation.<br>Mediates avoidance and fear. | Hypoactive. | Failure of top-down cortical inhibition.<br>Behavioural avoidance, cognitive avoidance.<br>Impaired interest and motivation, withdrawal, emotional numbing. | Avoidance.<br>Hyperarousal and reactivity. | Attention regulation.<br>Regulation of emotions. | Cognitive flexibility.<br>Increased emotion and self-regulation. |
| **Autonomic Nervous System (ANS)** | The Stress Response. | Hypo- or Hyper-active or flips between the two. | Wide range of physical and mental symptoms.<br>Poor emotion regulation.<br>Biochemical, endocrinological, and inflammatory dysfunctions. | Intrusions.<br>Avoidance.<br>Hyperarousal and reactivity.<br>Changes in mood and cognition. | Present-moment awareness.<br>Attentional control.<br>Acceptance of internal experience.<br>Enhanced interoceptive brain function. | Less reactivity, hypo- and hyper-arousal.<br>Stabilised and increased window of tolerance.<br>Increased emotion and self-regulation.<br>Increased agency and empowerment |

**Source:** Shin et al., 2006; Fox et al., 2014; Thomaes et al., 2014; Reed et al., 2015; Van der Kolk, 2015; Hays et al., 2015; Akiki et al., 2017; Schwartz and Maigerber, 2018; Fensten et al., 2018; Fitzgerald et al., 2018; Heningsberg et al., 2019; Manthay et al., 2020; Kang et al., 2020; Barizien et al., 2021; Reed et al., 2022; Kearney and Lanius, 2022; Petzold and Bunzeck, 2022; Forstenpointner, 2022.

**Appendix 6: Figure 3: PRISMA Flow Diagram for the search process.**




**Source:** Page et al., (2021)

## Appendix 7: Table 4: Final Studies included in SR.

| P. Ref | Author/Study | Study Design | Control Type | Sample Type | Sample Size N = | Gender Male (%) | Mean Age | Intervention | Intervention dosage |
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| **P1** | **Aizik-Reebs et al., (2021)**<br><br>Mindfulness-Based Trauma Recovery (MBTR-R). Randomised Waitlist Control of Efficacy and Safety. | RCT | Waitlist | Refugees | 95 (54/41) | 57 | 31.8 | MBTR-R | MBTR-R: 9 weeks x 2.5-hr sessions<br>Waitlist Control: nothing |
| **P2** | **Bremner et al., (2017)**<br><br>A Pilot Study of the Effects of Mindfulness-Based Stress Reduction on Post-traumatic Stress Disorder Symptoms and Brain Response to Traumatic Reminders of Combat in Operation Enduring Freedom/Operation Iraqi Freedom Combat Veterans with Post-traumatic Stress Disorder | RCT with specific active control | Person Centred Group Therapy (PCGT) | Veterans | 26 (17/9) | 100 | 34.47 | MBSR | MBSR: 8 weeks x 9 sessions of 2.5 hrs and an all-day (6 hr) retreat during week 6)<br>PCGT Control: 8 weeks x 9 sessions of 2.5 hrs and a barbeque at end. |
| **P3** | **Colgan et al., (2017)**<br><br>A Qualitative Study of Mindfulness Among Veterans With Posttraumatic Stress Disorder: Practices Differentially Affect Symptoms, Aspects of Well-Being, and Potential Mechanisms of Action | Qualitative study using Wahbeh et al., (2016) sample | N/A | Veterans | 102 | 90 | 52 | 4 arms of MBSR | All groups: 6 weeks x 60 min sessions. |
| **P4** | **Davis et al., (2019)**<br><br>A multisite randomized controlled trial of mindfulness-based stress reduction in the treatment of posttraumatic stress disorder. | RCT with specific active control | Person Centred Group Therapy (PCGT) | Veterans | 142 (65/77) | 84 | 51.74 | MBSR | MBSR: 8 weeks x 90 min sessions and a six-hr retreat before week 6.<br>PCGT: 8 weeks x 90-min sessions and a lunch gathering prior to week 8. |

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| **P5** | **Shapira et al., (2022)**<br><br>Biomarker Response to Mindfulness Intervention in Veterans Diagnosed with Post-traumatic Stress Disorder. | Study using pooled biomarkers and clinical outcomes from Polusny et al., (2015) and Davis et al., (2019) | N/A | N/A | 210 (106/104) | N/A | N/A | See Polusny et al., (2015) and Davis et al., (2019) | See Polusny et al., (2015) and Davis et al., (2019). |
| **P6** | **Dumarkaite et al., (2021)**<br><br>Effects of Mindfulness-Based Internet Intervention on ICD-11 Posttraumatic Stress Disorder and Complex Posttraumatic Stress Disorder Symptoms: a Pilot Randomized Controlled Trial | Internet-based RCT | Waitlist | University Students | 53 (17/36) | 12.9 | 23.34 | MBI internet | MBI: 8 weeks, dosage unknown<br>Waitlist Control: nothing. |
| **P7** | **Dumarkaite et al., (2022)**<br><br>The Effects of Online Mindfulness-Based Intervention on Posttraumatic Stress Disorder and Complex Posttraumatic Stress Disorder Symptoms: A Randomized Controlled Trial With 3-Month Follow-Up | Follow Up Study of Dumarkaite (2021) | N/A | N/A | 53 | N/A | N/A | MBI internet | MBI: 8 weeks, dosage unknown<br>Waitlist Control: nothing. |
| **P8** | **Dutton et al., (2013)**<br><br>Mindfulness-Based Stress Reduction for Low-Income, Predominantly African American Women With PTSD and a History of Intimate Partner Violence | Mixed methods study | none | Survivors of Interpersonal Violence (IPV) | 53 | 0 | N/A | MBSR | MBSR: 10 weeks x 1.5-hr sessions and a 5-hr retreat (scheduled between Sessions 8 and 9). |
| **P9** | **Kimbrough and Magyari (2009)**<br><br>Mindfulness Intervention for Child Abuse Survivors | Uncontrolled quantitative study | None | Survivors of Childhood Sexual Abuse (CSA) | 15 (19 but only 15 had met Criteria for PTSD) | N/A | 45 | MBSR | MBSR: 8 weeks x 2.5–3-hr classes and a 5-hr silent retreat. |

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| **P10** | **Earley et al., (2014)**<br><br>Mindfulness Intervention for Child Abuse Survivors: A 2.5-Year Follow-Up | Follow Up study of Kimbrough and Magyari (2009)) | N/A | N/A | 15 | 0 | N/A | N/A | N/A |
| P11 | M**uller Engelmann et al., (2017)**<br><br>Mindfulness-Based Stress Reduction (MBSR) as a Standalone Intervention for Posttraumatic Stress Disorder after Mixed Traumatic Events: A Mixed-Methods Feasibility Study | Mixed-methods study | None | Individuals with histories of mixed traumatic events | 9 | 28.6 | 47.14 | MBSR | MBSR: 8 weeks x 2.5 hr classes and an 8 hr day-long retreat at the end. |
| **P12** | **Gallegos et al., (2020)**<br><br>Effects of Mindfulness Training on Posttraumatic Stress Symptoms From a Community-Based Pilot Clinical Trial Among Survivors of Intimate Partner Violence | RCT | Wellness control group | Survivors of Intimate Partner Violence (IPV) | 39 | 0 | 42.67 | MBSR | MBSR: 8 weeks x 2 hr sessions<br>Wellness Control: received an education manual, followed by 15- min weekly individual check-in phone calls regarding the use of the manual for an 8-week period. |
| **P13** | **Goldberg et al., (2020)**<br><br>Efficacy and acceptability of mindfulness-based interventions for military veterans: A systematic review and meta-analysis | Systematic Review and Meta-analysis | mixed | Veterans | 898 | 100 | N/A | N/A | N/A |
| **P14** | **Goldsmith et al., (2014)**<br><br>Mindfulness-Based Stress Reduction for Posttraumatic Stress Symptoms | RCT | none | Veterans | 6<br>(9 but only 6 met criteria for PTSD) | 0 | 44 | MBSR | Not listed. |

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| **P15** | **Jasbi et al., (2018)**<br><br>Influence of adjuvant mindfulness-based cognitive therapy (MBCT) on symptoms of post-traumatic stress disorder (PTSD) in veterans - results from a randomized control study | RCT with nonspecific control. | Socio-therapeutic control condition | Veterans | 48 (24/24), 181 at start down to 48 completers. | 100 | 52.97 | MBCT | MBCT: 8 weeks x 60-70 mins<br>Socio therapeutic Control: 8 weeks x 70-180 mins weekly (including trips to the countryside). |
| **P16** | **Kearney et al., (2013)**<br><br>Effects of Participation in a Mindfulness Program for Veterans With Posttraumatic Stress Disorder: A Randomized Controlled Pilot Study | RCT | TAU | Veterans | 47 | 78.8 | 52 | MBSR | MBSR: 8 weeks x 2.5 hrs plus a 7-hr retreat session between weeks 6 and 7<br>TAU: supportive individual and group therapy . |
| **P17** | **Stephenson et al., (2017)**<br><br>Changes in Mindfulness and Posttraumatic Stress Disorder Symptoms Among Veterans Enrolled in Mindfulness-Based Stress Reduction | Follow up study of pooled data from Kearney et al. (2012), (2013) and two unpublished Kearney et al., (trials 3 and 4) from 2008–2012. | N/A | N/A | 113 | N/A | N/A | See Kearney et al. (2012), (2013 | See Kearney et al. (2012), (2013). |
| **P18** | **King et al., (2016)**<br><br>A Pilot Study of Mindfulness-Based Exposure Therapy in OEF/OIF Combat Veterans with PTSD: Altered Medial Frontal Cortex and Amygdala Responses in Social-Emotional Processing | RCT with specific active control | Person Centred Group Therapy (PCGT) | Veterans | 23 | 100 | 32.13 | MBET | MBET: 16 weeks x 2 hr sessions<br>PCGT: 16 weeks x 2 hr sessions. |
| **P19** | **Kelly and Garland (2016)**<br><br>Trauma-Informed Mindfulness-Based Stress Reduction for Female Survivors of Interpersonal Violence: Results From a Stage I RCT | RCT | waitlist | Survivors of Interpersonal Violence (IPV) | 12 (7/5) | 0 | 41.5 | MBSR | MBSR: 8 weeks, x 2- 2.5 hrs sessions<br>Waitlist Control: nothing. |

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| **P20** | **Liu and Qin (2021)**<br><br>Intervention effects of mindfulness-based stress reduction training on post-traumatic stress disorder in traffic accident survivors | RCT with non specific control | Person Centred Group Therapy (PCGT) | Traffic accident survivors | 52 | 37 | 0 | MBSR | MBSR: 8 weeks x 50 min sessions<br>PCGT: 8 week x 50 min sessions. |
| **P21** | **Liu et al., (2022)**<br><br>The efficacy of mindfulness-based stress reduction intervention 3 for post-traumatic stress disorder (PTSD) symptoms in patients with PTSD: A meta-analysis of four randomized controlled trials | Meta-analysis | Mixed | Survivors of Interpersonal Violence (IPV), traffic accidents, veterans | 768 | N/A | 51.7 | MBSR | N/A |
| **P22** | **Niles et al.,(2012)**<br><br>Comparing mindfulness and psychoeducation treatments for combat-related PTSD using a telehealth approach | RCT (telehealth) | psychoeducation | Veterans | 27 | 100 | 52 | MBSR | 8 weeks of telehealth treatment (2 x 45 min in-person sessions followed by 6 sessions over the phone). |
| **P23** | **Niles et al., (2013)**<br><br>Changes in Mindfulness Following a Mindfulness Telehealth Intervention | A follow-up study of Niles et al (2012) | N/A | Veterans | 27 | N/A | 0 | MBSR | 8 weeks of telehealth treatment (2 x 45 min in-person sessions followed by 6 sessions over the phone). |
| **P24** | **Bishop et al.,(2018)**<br><br>Methylation of *FKBP5* and *SLC6A4* in Relation to Treatment Response to Mindfulness-Based Stress Reduction for Posttraumatic Stress Disorder | Follow up study on 22 participants from Polusny et al.(2015) | N/A | Veterans | 22 | N/A | 0 | N/A | N/A |

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| **P25** | **Polusny et al.,(2015)**<br><br>Mindfulness-Based Stress Reduction for Posttraumatic Stress Disorder Among Veterans | RCT with specific active control | Person Centred Group Therapy (PCGT) | Veterans | 99<br>116 (58/58) but (85.3%) completed treatment | 84 | 58.8 | MBSR | MBSR: 8 x 2.5-hr sessions and 1 day-long retreat<br>PCGT 9 weekly 1.5-hr sessions. |
| **P26** | **Kang et al.,(2022)**<br><br>Interoception Underlies Therapeutic Effects of Mindfulness Meditation for Posttraumatic Stress Disorder: A Randomized Clinical Trial | Follow up study of pooled data from Polusny et al (2015) | N/A | Veterans | 98 (47/51) | 0 | N/A | MBSR | MBSR: 8 x 2.5-hr sessions and 1 day-long retreat<br>PCGT 9 weekly 1.5-hr sessions N/A. |
| **P27** | **Powers et al., (2023)**<br><br>Primary Care-Based Mindfulness Intervention for Posttraumatic Stress Disorder and Depression Symptoms Among Black Adults: A Pilot Feasibility and Acceptability Randomized Controlled Trial | Randomized pilot feasibility study | Waitlist | Black adults with trauma histories | 26 (11/15) | 84.8 | 44.4 | MBCT | MBI: 8 weeks x 90 mins. |
| **P28** | **Schure et al.,(2018)**<br><br>Mindfulness-Based Processes of Healing for Veterans with Post-Traumatic Stress Disorder | Qualitative using semi structured in-depth interviews | N/A | Veterans | 15 | 60 | N/A | MBSR | MBSR: 8 X 2.5 hr sessions plus 1 x day long retreat. |
| **P29** | **Sun et al., (2021)**<br><br>Military-related posttraumatic stress disorder and mindfulness meditation: A systematic review and meta-analysis. | Systematic Review and Meta-analysis | mixed | Veterans | 1326 | N/A | 0 | Mix of MBIs | N/A |