MINDFULNESS-BASED TREATMENTS FOR VETERANS WITH POST-TRAUMATIC STRESS DISORDER: A SYSTEMATIC LITERATURE REVIEW

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William Jeff Comer

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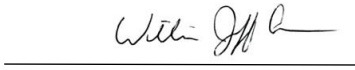

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ABSTRACT

Posttraumatic stress disorder (PTSD) in veterans is a devastating psychophysiological response to traumatic experiences encountered during military service. Rates of PTSD, co-morbidities, and suicide remain higher than the general population for veterans. The Veterans Administration (VA) has defined *strongly* recommended practices, which include cognitive behavioral therapy, eye movement desensitization and reprocessing, cognitive processing therapy, and prolonged exposure therapy. However, the majority of veterans do not initiate these treatments, find little symptomatic relief from the treatments, or discontinue the treatments altogether. This void of treatment success results from veterans' shame, involving mental health stigma. The purpose of this qualitative systematic literature review (SLR) was to evaluate non-conventional treatments that embrace mindfulness techniques and their effectiveness for therapeutic inclusion for veterans diagnosed with PTSD. Mindfulness-based practices, whether cognitive or somatic, were found to be effective in mitigating sympathetic nervous system (SNS) and hypothalamus-pituitary-adrenal (HPA) activation, improving the chronic dysregulated allostatic effects of stress reactivity. Studies included in this SLR demonstrated that by reducing SNS and HPA activation, decreased PTSD symptoms and co-morbidities resulted. Three concluding recommendations for psychotherapists are proposed: (1) address stigma and shame, (2), foster eudaimonic outcomes, and (3) include mindfulness-based practices. These recommendations provide a scenario where veterans can moderate their levels of shame, derive biopsychosocial benefits from the practices themselves, diminish their PTSD symptoms, and cultivate increased meaning in life.

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CHAPTER ONE

OVERVIEW OF THE STUDY

When diagnosed with post-traumatic stress disorder (PTSD), veterans in the United States can face varied daunting challenges. Daily problems encountered can include the following: strained personal relationships, inability to function at work, mental health diagnoses and co-morbidities, physiological diseases, substance use, injuries, dissociation, homelessness, difficulty finding meaning in life, chronic pain, guilt, shame, and the constant re-living of the traumatic experiences they encountered that lead to PTSD (APA, 2013; APA, 2017; Blakey et al., 2018; Elboken, 2018; Feduccia, 2019; Polusny et al., 2015; Schoner et al., 2017; VA/DOD, 2017). PTSD affects approximately 20% of veterans; however, there is extensive variation based on which era of conflict is studied (Kelmendi et al., 2017). The Veterans Administration (VA) reported PTSD prevalence of 20% from the Afghanistan war, 14% from the Iraqi war, 12% from the Gulf war, and 30% from the Vietnam war (Gradus, 2020). Conservatively, 22 veterans commit suicide per day, which is over two times higher than the entire population in the United States and is thought to frequently be a result of complications of PTSD and related comorbidities (Castro & Kintzle, 2014; Gradus, 2020). Given the large number of veterans with PTSD and those who commit suicide each day it appears that effective treatments are not sufficiently applied in therapeutic settings or veterans are not embracing them (Blakey et al., 2018; Elboken, 2018; Gradus, 2020; Paige et al., 2018; Pearson et al., 2020; Russell & Figley, 2017). In fact, 40% of veterans avoid treatment altogether, 70% of veterans find little or no relief from symptoms from treatments, and up to 62% of veterans drop out of the treatments (Cushing & Braun, 2018; Mitt et al., 2014; Steenkamp, 2016; Watts et al., 2014).

Specifically, in this systematic literature review three goals will be addressed to provide guidance to psychotherapists in treating veterans with PTSD. First, the originating etiology of stress reactivity and its downstream effects on PTSD will be reviewed. PTSD for veterans results from multiple traumatic experiences that engage the stress reactivity sympathetic nervous system (SNS) and hypothalamus-pituitary-adrenal (HPA) axis with corresponding physiologic and psychological pathway excitation, leading to acute and chronic stress dysregulation (APA, 2013; APA, 2017; Gindi et al., 2016). Intense acute episodic and continual longitudinal chronic stress reactivity can lead to a range of disorders, including cardiovascular disease, endocrinological disease, neurological diseases, inflammatory diseases, gastrointestinal diseases and psychological disorders, including PTSD (Blakey et al., 2018; Feduccia, 2019; Schoner et al., 2017). Understanding this causal factor of PTSD can help to evaluate new treatment options that may be effective for psychotherapists.

Second, current mindfulness-based treatments shown effective for treating veterans with PTSD will be studied. Mindfulness is a well reported concept that involves focusing on purposeful awareness that results from paying attention to current tasks in the present moment, non-judgmentally, and free from emotional attachment (Harrison, 2017; Tomlinson, 2018). Mindfulness-based techniques are reported to be effective in reducing the negative cumulative effects of stress reactivity in veterans with PTSD (Barr et al., 2019; Cramer, Anheyer, Saha, & Dobos, 2018; Neukirch, Reid, & Shires, 2018). Treatments studied will be based on well-researched mindfulness techniques, which encompass two approaches: cognitive and somatic. Cognitively focused mindfulness-based techniques, including concepts such as meditation and mindfulness-based stress reduction (MBSR), are techniques drawn from an internal locus of control framework whereby the person demonstrates control over his or her thoughts, leading to

more positive cognitive appraisal and regulation (Fukuzawa & Inamasa, 2020). Somatic-based mindfulness practices, such as yoga or martial arts, blend mental discipline with kinesthetic movement, unifying mind and body.

Third, recommendations based on the review for incorporating mindfulness-based best practices into psychotherapeutic settings will follow. There is no lack of research on treatments for PTSD. This study will provide a summary of the best practices that are available specific to veterans with PTSD and how to implement them in therapy. In addition to the volume of research present, implementing best practices for veterans can be quite challenging as many veterans have substantial stigmas towards asking for help overall, which can present barriers for treatment (Barr et al., 2019; Hamilton, Coleman, & Davis, 2016; Heath et al., 2017; Paige et al., 2018; Pearson et al., 2020).

Background of the Problem

When on active duty, many veterans operated within extremely dangerous conditions, leading to considerable acute and chronic physiological and psychological stress reactivity pathways and subsequent elevated allostatic loads (Fraher & Branicki, 2017; Smith, Young, & Crum, 2020). Although military personnel receive basic training on acute stress, there appears to be a missing component of stress mitigation techniques as revealed by high levels of PTSD, co-morbidities, and suicide in veterans (Barr et al., 2019; Gradus, 2020; Hamilton, Coleman, & Davis, 2016; Heath et al., 2017). Unfortunately, many veterans suffer substantial long-term trauma and do not receive the vast array of help that is available (Russell & Figley, 2017). Cushing and Braun (2018) reported that up to 40% of veterans with PTSD do not seek any treatment at all. Additionally, in 2011 researchers calculated the healthcare costs of treating

veterans with PTSD just from the most recent Iraq and Afghanistan conflicts at $2.7 billion annually (Cesur, Sabia, & Tekin, 2011).

Many veterans face a life of PTSD, multiple co-morbidities, and adjustment issues related to episodic and longitudinal stress reactivity encountered during combat situations and the resulting compartmentalization of the stress and trauma (APA, 2013; Barr et al., 2019; Neukirch, Reid, & Shires, 2018; Russell & Figley, 2017). As the DSM-5 reports, PTSD can develop after exposure to one or more traumatic events, involving threatened death, serious injury, violence through direct experience, or being a witness to the event (APA, 2013). This trauma significantly impairs everyday functioning, relationships, and quality of life, often as a result of the impacts of chronic stress reactivity (APA, 2013). Although PTSD starts within one month of the event, symptoms may not appear for years (APA, 2013). Additionally, many co-morbidities may act concurrently with PTSD. For example, veterans with PTSD are 80% more likely to meet diagnostic criteria for depression, bipolar disorder, anxiety, or substance use disorders (APA, 2013). Finally, veterans with PTSD are 48% more likely to present with effects of traumatic brain injury, further complicating diagnosis and treatment (APA, 2013).

There are several conventional evidence-based treatments for PTSD that have been shown empirically effective and have been *strongly* recommended by the VA for treatment in veteran populations who have PTSD (APA, 2013; APA, 2017; Cramer, Anheyer, Saha, & Dobos, 2018; Cushing & Braun, 2018; McCarthy et al., 2017; Mehling et al., 2017; Neukirch, Reid, & Shires, 2018; Polusny et al., 2015; VA, 2020; VA/DOD, 2017). These include cognitive behavioral therapy (CBT), cognitive processing therapy (CPT), eye movement desensitizing reprocessing (EMDR), and prolonged exposure therapy (PET). There are only two pharmacological agents approved by the Food and Drug Administration (FDA) to treat veterans

with PTSD: sertraline (Zoloft) and paroxetine (Paxil), which are selective serotonin reuptake inhibitors (SSRIs); however, there are a range of other medications that can be used to treat the co-morbidities of PTSD, including anti-depressants and anti-anxiolytics (Abdallah et al., 2019; APA, 2013; APA, 2017; Kelmendi et al., 2017). Interestingly, there have been no new medications approved for treating veterans with PTSD in over 15 years (Kelmendi et al., 2017). The medications used for PTSD symptoms in veterans and associated co-morbidities have been reported as showing suboptimal results in providing relief from related symptomology (Kelmendi et al., 2017).

Although conventional approaches have been shown to be effective, it has also been reported that they can provide limited efficacy for some veterans with PTSD, yielding high drop-out rates and continued residual symptoms post treatment (Barr et al., 2019; Cushing & Braun, 2018; Holmes & Snape, 2019; Neukirch, Reid, & Shires, 2018). For example, Steenkamp et al. (2016) found that the commonly used conventional treatments in studies of veterans with PTSD have shown that more than 70% of those engaging in conventional PTSD treatments see no reduction in symptoms or co-morbidities. Additionally, Lee et al. (2016) conducted a meta-analysis of 55 studies, evaluating conventional treatments for veterans with PTSD, including medications and psychotherapeutic approaches, and found the mean dropout rate of the studies to be 29%. Finally, other studies have shown that less than 10% of veterans with PTSD complete conventional-based therapies (Mitt et al., 2014; Watts et al., 2014).

Although there is demonstrated efficacy with conventional treatments, these approaches are not reaching all veterans, leaving many without effective treatment (Holmes & Snape, 2019; Lee et al., 2016; Steenkamp, 2016). On the other hand, mindfulness-based therapies have been found effective by themselves or when combined with conventional therapies for PTSD,

particularly when the PTSD results from unmitigated chronic stress reactivity pathway engagement experienced by veterans (Barr et al., 2019; Cramer, Anheyer, Saha, & Dobos, 2018; Neukirch, Reid, & Shires, 2018; Polusny et al., 2015). Mindfulness-based approaches stem from a different contextual framework than conventional approaches. Namely, having veterans confront their trauma directly through conventional approaches in a structured therapeutic setting can be traumatic itself. Instead, by using mindfulness approaches the effects of the trauma(s) can often be mitigated without direct confrontation of the instigating traumatic memories. This can be particularly effective when dissociative states are present (APA, 2013; APA, 2017; VA/DOD, 2017). Maintaining longitudinal efficacy with trauma-focused treatment can present the veteran with a painful atmosphere, resulting from increased SNS and HPA excitation. This increased stress reactivity can compound the original stress caused by the traumatic event(s). This can lead to disruption of memory recollection and increased fear, yielding furthered difficulty in treating veterans with PTSD (Schnyder et al., 2015; Feduccia et al., 2019). Mindfulness-based treatments are designed by concept to reduce stress reactivity retroactively, concurrently, and proactively to help ease cognitive processing of traumatic memories, leading to less fear and more effective treatment outcomes (APA, 2017; Barr et al., 2019; Cramer, Anheyer, Saha, & Dobos, 2018; Neukirch, Reid, & Shires, 2018).

Many stress reduction techniques exist in the literature or are well grounded with anecdotal efficacy. A growing body of evidence is showing that mindfulness-based mitigators of stress, such as meditation and yoga, are longitudinally and cross-situationally effective for reducing stress reactivity on acute and chronic bases, both proactively and retroactively, and may be more effective with active military combat personnel and veterans with PTSD (Barr et al., 2019; Cramer, Anheyer, Saha, & Dobos, 2018; Cushing & Braun, 2018; Neukirch, Reid, &

Shires, 2018). Considerable studies have been done, describing mindfulness mitigation techniques for veterans with PTSD; however, it is frequently reported in the research that treatments for veterans are fragmented, the approaches to dealing with PTSD are not coordinated, and the techniques have been slow to be implemented in therapeutic settings (Castro & Kintzle, 2014; Holmes & Snape, 2019; VA/DOD, 2017).

Delayed implementation of mindfulness-based techniques often results from confusion about the volume of research on mindfulness-based practices, leading to misunderstanding as to what approaches are most effective (Holmes & Snape, 2019; McKibben & Nan, 2017; Paige et al., 2018). Additionally, stigma toward receiving treatment for veterans is particularly high, is ingrained in historical military culture, and must be addressed to implement chronic psychological stress reduction techniques with the goal of ameliorating symptoms of PTSD and associated co-morbidities (Barr et al., 2019; Hamilton, Coleman, & Davis, 2016; Heath et al., 2017; Paige et al., 2018; Pearson et al., 2020). Mindfulness approaches are often a more accepted treatment among active duty combat forces and veterans suffering from PTSD, as they correlate well with practices taught during training such as box breathing and proactive visualization techniques for stress mitigation (Paige et al., 2018; Pearson et al., 2020). This study will provide a summary of common mindfulness-based practices with recommendations for how to implement them in therapeutic atmospheres, involving veterans with PTSD.

Statement of the Problem

As described, PTSD can lead to devastating effects to veterans who suffer from it. Additionally, the prevalence of diagnosed PTSD and suicide rates are increasing, suggesting that current treatments are not effective, not implemented well, or not resonating with veterans with PTSD who discontinue treatment or do not seek it to begin (Barr et al., 2019; Hamilton,

Coleman, & Davis, 2016; Heath et al., 2017; Paige et al., 2018; Pearson et al., 2020). Specifically, the problem to be addressed in this study is that research reports numerous mindfulness-based treatments that are effective in helping veterans suffering from PTSD; however, given the negative trends of increasing PTSD, these treatments are not being successfully incorporated into contemporaneous psychotherapeutic interventions, which warrants further research to assist psychotherapists (Castro & Kintzle, 2014; Holmes & Snape, 2019; VA/DOD, 2017).

Purpose of the Study

The purpose of this study was to conduct a qualitative systematic literature review, studying select best practice cognitive and somatic-based mindfulness treatments that are suggested to be effective in helping veterans to find relief from PTSD and common co-morbidities, including suicide. Ideally, these best practices when implemented may be able to help reverse the negative trend of increasing PTSD and suicide all too common in veteran populations.

As there is considerable research published on mindfulness-based approaches, the structure of this study was narrowed. Specifically, this SLR evaluated two categories of mindfulness-based treatments: (1) cognitive based, including MBSR and meditation, and (2) somatic based, including yoga and martial arts. Due to the wide-ranging amount of literature, this study intended to review specific effective mindfulness-based treatments and provide recommendations that can be used in the therapeutic setting to treat veterans with PTSD as stand-alone therapies or in conjunction with conventional treatments.

Research questions to be addressed in this systematic literature review include the following four inquiries:

Research Question One. How do mindfulness-based treatments, in general, reduce stress reactivity in veterans diagnosed with PTSD?

Research Question Two. What aspects of cognitive-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans?

Research Question Three. What aspects of somatic-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans?

Research Question Four. What recommendations are supported for implementing mindfulness-based practices into psychotherapy for veterans diagnosed with PTSD?

Theoretical Framework

The theoretical framework is an important concept in research endeavors. The framework guides the researcher and includes the concepts, assumptions, and theories underlying the research design and approach (Creswell & Creswell, 2018; Wong & Breheny, 2018). The theoretical framework should underlie the structure of the literature review and research questions (Creswell & Creswell, 2018; Wong & Breheny, 2018). This Doctoral Project will entail one predominant underlying theoretical framework: mindfulness-to-meaning theory advocated by Garland and colleagues.

Mindfulness-to-meaning theory (MTMT) suggests that the development of mindfulness can allow one to recondition stress appraisals into a metacognitive state that allows for a constructive expansion of awareness to previous information about one's life (Garland et al., 2015a; Garland et al., 2015b). In other words, MTMT allows a person to reframe traumatic, negative circumstances, thereby, reducing pent up previous and current stress reactivity. This allows for the development of a more positive emotional state. This new state permits a person

to find a more pleasant, growth-oriented life. This can eventually progress to the fulfillment of a greater purpose in life, and ultimately, a Maslow concept of self-actualization.

In completing an initial literature review of treatments for veterans with PTSD, conventional therapies such as CBT, CPT, EMDR, and PET were reviewed, as they are *strongly* recommended by the VA (VA/DOD, 2017). However, as previously discussed, although these treatments have shown efficacy, they can also be characterized by high dropout rates or provide no symptomatic relief for some veterans with PTSD. Even with the extensive research that has been completed on veterans with PTSD, rates of symptoms and suicide continue to rise. As a result, this doctoral project will focus exclusively on mindfulness-based concepts for treating veterans with PTSD. There are a significant number of mindfulness-based treatments reported in the literature, including mindfulness itself, present moment focus, meditation, acceptance, breath control, visualization, mindset, yoga, martial arts, grounding, equine therapy, acupuncture, and massage to name a few. According to the theoretical framework advocated by mindfulness-to-meaning theory, mindfulness-based treatments can help veterans achieve better psychological mindsets, which will enable them to progress more effectively through the strongly recommended conventional treatments advocated by the VA. From this theoretical context, the dropout rates and completion rates may improve, providing greater relief to veterans with PTSD and the opportunity to enjoy more fulfilling and meaningful lives.

Significance of the Study

The findings from this study provide empirically validated best practices for psychotherapists to incorporate with veterans suffering from PTSD; thereby providing more effective care to mitigate the rates of PTSD and associated co-morbidities, including suicide. Research shows that effective use of mindfulness-based best practices improves the effects of

stress reactivity causing PTSD and can lead to reduced long-term negative physiological and psychological effects of PTSD, increased work productivity, improved relationships, and happier affect overall (Barr et al., 2019; Cramer, Anheyer, Saha, & Dobos, 2018; Harrison, 2017; Neukirch, Reid, & Shires, 2018; Rodriguez et al., 2018; Straub & Cutolo, 2017). Mindfulness-based practices can be used alone or in combination with strongly recommended therapies and provide solid therapeutic basses to reduce the high conventional treatment dropout rates experienced by veterans with PTSD.

The results of this study are intended to guide psychotherapeutic initiatives to improve the lives of veterans who suffer from PTSD. Although the research is focused on veterans with PTSD, the concepts behind the best practice mindfulness-based treatments presented can be applied to other conditions, including non-veteran PTSD, depression, bipolar disorder, seasonal affective disorder, stress disorders, personality disorders, and generalized well-being.

Limitations and Delimitations of the Study

Several limitations were present in this study. First, this study was a systematic literature review, which is theoretical contextually. No qualitative or quantitative hypotheses were tested. Second, the body of current research pertaining to mindfulness-based treatments appears to be quite large, requiring specific mindfulness-based treatments to be considered at the exclusion of others. Third, research that is reported was frequently outdated or so specific that it loses relevance for a generalist psychotherapist. Fourth, terminology for mindfulness-based practices were reported as being inconsistent. In this study, consistent definitions for the treatment studied will be applied.

Regarding delimitations, this study will focus on the following mindfulness-based practices: (1) cognitive approaches, including MBSR and meditation, and (2) somatic

approaches, including yoga and martial arts. There are numerous additional complimentary style treatments, including hormonal therapy, supplementation, nutrition, acupuncture, spirituality, sleep improvement, massage therapy, environmental toxicity reduction, and others. To narrow the scope for this study delimitations were applied. Additionally, although PTSD affects many populations suffering from traumatic experiences, this study focuses on PTSD found in veterans. Finally, the biopsychosocial model of PTSD etiology is well-researched with many causal factors present within each realm of the model shown to contribute to PTSD development (APA, 2013). This study focused on the psychological stress reactivity induced etiology, contributing to the development and treatment of PTSD in veterans, which appears to be effectively treated with mindfulness-based best practices.

Definitions and Key Terms

The following terms are included to provide consistent definitions and understanding of central concepts incorporated in this study.

Acceptance. A mindset-based emotional regulation mechanism, providing an orientation of receptivity and non-interference with present moment experiences even when they are uncomfortable (Lindsay & Crestwell, 2019). Acceptance is an important component of mindfulness.

Allostatic Load. The physiological toll of chronic exposure to elevated SNS, HPA, endocrine, and neural responses, resulting from perpetual chronic stress (Garfinkel & Critchley, 2015; Rodriguez, 2018).

Conventional, or Strongly Recommended, PTSD Treatments. Conventional treatments for veterans with PTSD are varied and include evidence-based psychotherapeutic and pharmacologic interventions. Psychotherapeutic interventions supported include cognitive

behavioral therapy (CBT), cognitive processing therapy (CPT), eye movement desensitization reprocessing (EMDR), and prolonged exposure therapy (PET) (APA, 2017; VA/DOD, 2017). Pharmacologic interventions for PTSD include the use of two FDA approved medications: sertraline and paroxetine along with anti-depressants and anti-anxiolytics (APA, 2017; Kelmendi et al., 2017).

Cytokines. Pro-inflammatory proteins released during sympathetic activation, which increase inflammation and affect most chronic mental and physical disease states (Katharina et al., 2014; Rodrigues Pereira & Correa Leite, 2016; Yuen & Sander, 2017).

Fear Response. An increased sense of fear that is a byproduct of stress reactivity and a primary characteristic of PTSD. Fear response can lead to hyperarousal, hypervigilance, an exaggerated startle response, and heightened aggression, resulting from (1) hyperactivity in the amygdala, and (2) reduced pre-frontal cortex modulation (Etkin & Wager; Feduccia, 2018; Mithoefer, 2018).

Gamma Amino-Butyric Acid (GABA). Inhibitory neurotransmitter that is decreased during sympathetic activation, leading to hyperarousal and contributing to allostatic loads (Streeter et al., 2012).

Holistic Health Practices. Practices that integrate the mind (cognition and emotion), body (physiological well-being), and spirit (connection to higher power, nature, self, and other people) in order to improve overall wellness (McKibben & Nan, 2017).

Homeostasis. Mechanisms that maintain the parameters of a person's internal milieu within the ranges necessary for survival and optimization (Streeter et al., 2012).

Hypothalamus-Pituitary-Adrenal Axis (HPA). The HPA axis is a hormonal pathway system, which in response to stress, initiates the release of corticotrophin-releasing hormone

(CRH) from the hypothalamus. CRH results in a series of endocrine events, leading to the release of cortisol from the adrenal cortex and other hormones, including testosterone, estradiol, or oxytocin among others (Rotenberg & McGrath, 2016; Stephens et al., 2016).

Internal Locus of Control. The extent to which individuals believe that they can influence their own life and fate (Fukazawa & Inamasu, 2020).

Interoception. Internal self-awareness of cognitions, emotions, and physiological processes – mind and body cognizance (Johnson et al., 2015).

Meditation. A mindfulness-based method to relax the mind through focusing on a single act such as breathing, which decreases HPA and sympathetic activation; thereby, reducing stress reactivity (Harrison, 2017; Turakitwanakan, Mekseepralard, & Busarakumtragul, 2013).

Mindfulness. Purposeful awareness that results from paying attention to current tasks in the present moment, non-judgmentally, and free from emotional attachment (Harrison, 2017; Tomlinson, 2018).

Mindfulness-Based Treatments. For purposes of this study mindfulness-based practices include two categories of holistic techniques (Fraher & Branicki, 2017; Pasco, Thompson, & Ski, 2017; Smith, Young, & Crum, 2020; Vogus & Sutcliffe, 2017), including the following:

(1) Cognitive approaches, including MBSR and meditation where an internal locus of control is instilled, guiding the person to a present moment focus of their surroundings and task(s). This provides more robust control over thoughts, leading to more positive cognitive appraisal and regulation (Fukuzawa & Inamasa, 2020).

(2) Somatic-based practices, including yoga and martial arts, which blend mental focus with bodily movement, combining mind and body into one symbiotic motion in the present moment.

To narrow this study, other mindfulness-based practices will not be considered due to the breath of practices available.

Mindset. The core assumptions about the nature of the processes in the world, which orient people to a particular set of expectations, attributions, and goals. People who take a "stress is enhancing mindset" have better outcomes with stress and fewer negative physiological and psychological detriments from stress (Smith, Young, & Crum, 2020).

Parasympathetic Nervous System (PNS). Part of the autonomic nervous system (ANS), the PNS releases a neurotransmitter, acetylcholine, through the vagus nerve, which counteracts the excitatory effects of the SNS, returning the ANS to homeostasis (Rodrigues Pereira & Correa Leite, 2016; Yuen & Sander, 2017). The PNS is known as enacting the "rest and digest process," mitigating the fight, flight, or freeze SNS activation.

Post-Traumatic Stress Disorder (PTSD). A psychological disorder that can develop after exposure to one or more traumatic events, involving threatened death, serious injury, violence through direct experience, or being a witness to the event (APA, 2013). This trauma significantly impairs everyday functioning, relationships, and quality of life (APA, 2013). PTSD starts within one month of the event, but symptoms may not appear for years (APA, 2013). For this study, PTSD will be centered on those veterans who suffer from stress reactivity, leading to PTSD.

Stress. Stress is a real or interpreted threat to the physiological or psychological integrity of an individual that results in physiological and behavioral responses (Verma, Singh Balhara, & Gupta, 2011).

Stressor. An event or condition, leading to the potential for a stress reaction.

Stress Reactivity. The stress response process, commonly known as the "fight, flight, or freeze" (FFF) reaction is the evolutionary physiological and psychological pathway that has enabled humans to avoid predatory threats and survive as a species (Goldstein, 2010; Goyal et al., 2014; Harrison, 2017). Chronic elevated stress levels have been shown to lead to numerous disorders, including obesity, diabetes, high blood pressure, inflammatory diseases, cancer, dementia, depression, anxiety, and PTSD (Rotenberg & McGrath, 2016; Straub & Cutolo, 2017).

Sympathetic Nervous System (SNS). Part of the ANS the SNS engages the physiological processes leading to stress reactivity, preparing the body for physical engagement of the fight, flight, or freeze response (Rotenberg & McGrath, 2016).

Vagus Nerve. The longest of the 12 cranial nerves, stretching from the medulla oblongata to the colon. The vagus nerve releases acetylcholine, a neurotransmitter, which reduces sympathetic activation through parasympathetic engagement. This yields a calming effect, including improvements in heart rate, blood pressure, respiratory rate, digestive system function, cortisol, adrenaline, and inflammation from cytokines (Rodrigues Pereira & Correa Leite, 2016; Yuen & Sander, 2017).

Organization

The doctoral project is organized into five chapters. Chapter one provides an overview of the research conducted, including an introduction, background of the problem, statement of the problem, purpose of the study, theoretical framework, significance of the study, limitations, and delimitations, key terms and definitions, and the organization of the study. Chapter two summarizes results from a comprehensive literature review of mindfulness-based best practices for treating veterans with PTSD. Chapter three provides the methodology used to analyze the literature search results and subsequent data. Chapter four provides results of the study, leading

to best-practices well-suited for psychotherapeutic settings. Chapter five provides a discussion of the research, including recommendations for future research

CHAPTER TWO

LITERATURE REVIEW

PTSD affecting veterans has a complicated etiology, involving psychological and physiological considerations. As a stress disorder, PTSD in veterans is caused in part by excitation of the stress reactivity process, resulting from witnessing traumatic situations (APA, 2013). This systematic literature review will investigate mindfulness-based treatments as effective interventions for veterans with PTSD. Research presented is broken into three categories. First, an overview of stress and stress reactivity is discussed. Second, PTSD and combat stress reactivity in veterans are covered. Third, mindfulness-based treatments that have been shown effective in reducing PTSD symptomology and co-morbidities specifically in veterans will be reviewed. Mindfulness-based treatments are further divided into two categories: (1) cognitive-based treatments, including meditation and MBSR and (2) somatic-based treatments, including yoga and martial arts.

Stress

Stress is a real or interpreted threat to integrity of an individual that results in physiological, cognitive, somatic, and behavioral responses and potential homeostatic dysregulation (Garfinkel & Critchley, 2015; Verma et al., 2011). A stressor is an event or condition, leading to the potential for a stress reaction. Stressors can place the body in a condition of allostatic load, which is the physiological toll of chronic exposure to elevated endocrine and neural responses, resulting from perpetual chronic stress (Garfinkel & Critchley, 2015; Rodriguez, 2018). As described by Greenberg (2017) stressors can be emergent (a person breaking into one's house), psychological (threats to self-esteem), social (unemployment), philosophical (purpose of life), spiritual (is there a God?), environmental (toxins), or guilt driven

(lying, adultery). Stress in-and-of-itself can be considered (1) distressful, resulting from a negative stressor such as a death in the family, and (2) eustressful, resulting from a positive stressor such as marriage or a promotion (Robinson, 2018). However, physiological reactions to distress and eustress are identical (Robing, 2018). It is important to note that stress with a short duration can lead to greater performance, as it causes individuals to better prepare for stressful activities, providing better outcomes (e.g., rehearsing for a stressful presentation). The detrimental aspects of stress occur when stress becomes a heightened, perpetual, unmitigated chronic state of arousal, leading to high allostatic loads (Harrison, 2017; Rodriguez et al., 2018; Straub & Cutolo, 2017). Longitudinal stress leads to allostatic stasis, a detrimental biological effect reducing homeostatic balance, producing physiological strains. This can condition can result in a range of chronic conditions, including diabetes, high blood pressure, inflammation, obesity, cancer, dementia, depression, and anxiety (Harrison, 2017; Rodriguez et al., 2018; Straub & Cutolo, 2017; Streeter et al., 2012).

Stress Reactivity

Stress reactivity, or the stress response process, commonly known as the fight, flight, or freeze response (FFF), is the evolutionary psychological and physiological pathway that has enabled humans to avoid predatory threats and survive as a species (Goldstein, 2010; Goyal et al., 2014; Harrison, 2017; Robinson, 2018). Originally intended to provide a response to immediate emergent stressors, the FFF response does not serve contemporaneous humans well in everyday life. Normal stressors of daily life that humans encounter engage the stress reactivity process as if they were true life or death emergent stressors. In other words, regardless, of the context of the stressor, the physiological stress reactivity response is the same.

Stress reactivity has a complex pattern of biopsychosocial etiology, involving multiple scientific disciplines, including physiology, medicine, chemistry, genetics, endocrinology, neurosciences, epidemiology, and most recently psychology (Robinson, 2018). Additionally, although physiological arousal of stress reactivity is similar in men and women, there are notable differences that must be considered, which can lead to divergent patterns of stress reactivity responses, particularly regarding hormonal pathways, which will be discussed later (Goldstein et al., 2010; Olff, 2017; Pooley, 2018; Verma et al., 2011). Stress reactivity involves the autonomic nervous system (ANS), which is composed of the sympathetic nervous system (SNS) and parasympathetic nervous system (PNS).

The FFF response process initially engages through the autonomic nervous system's sympathetic system and eventually effects all bodily systems as presented by Arnsted et al. (2015), Garfinkely and Critchley (2015), Verma, Singh Balhara, and Gupta (2011) and Van der Kolk (2014). As these authors described, initially, a threat is detected through the sensory systems by the thalamus. The thalamus sends the information for processing to the amygdala, the primitive emotional processing center of the brain. This threat could range from a true emergency such as an active shooter to a minor frustration such as being cutoff in traffic. Regardless, the FFF response is the same and is driven by the SNS and HPA. The primary role of the FFF response is to prime the body for immediate action for survival.

When a stressor is perceived through sensory organs, electrical neurochemical signals are transmitted to the brain where the amygdala initiates the FFF process by engaging the HPA. The hypothalamus and amygdala are centric in excitation of the SNS and are both involved in memory function, emotion processing, mediation of psychological stress, and modulation of HPA response to perceived stressors (Streeter et al., 2012). Specifically, the hippocampus is

centric to explicit memory (long term memory) and the amygdala is centric for threat perception, emotional memory, and reactivity (Streeter et al., 2012). Interestingly, veterans with PTSD tend to have impaired explicit memory and reduced hippocampal volume (Streeter et al., 2012). The hippocampus plays a centric function in interacting with the SNS, HPA axis and gamma amino-butyric acid or GABA (Streeter et al., 2012).

Once the hypothalamus is directed by the amygdala, it secretes corticotrophin-releasing hormone (CRH). This signals the anterior lobe of the pituitary gland to secrete adrenocorticotropic hormone (ACH). ACH causes the adrenal glands to secrete adrenaline (epinephrine). Adrenaline initiates the activity of other hormones, including cortisol, testosterone, estrogen, and oxytocin, which are part of the full engagement of the HPA and sympathetic actions. Testosterone predominantly affects men's stress response and estrogen and oxytocin affect women's, which will be discussed in detail later.

This resulting response prepares the person to deal with the threat - whether real or perceived. The heart rate and blood pressure increase, sending blood to the muscles. The muscles swell with the blood flow and become primed to act. The pupils dilate, improving narrow visual focus. The digestion system slows, releasing stored fatty acids and glucose into the blood stream to increase energy output. Additionally, cytokines, pro-inflammatory proteins, are released, which increase inflammation and affect most chronic mental and physical disease states (Katharina et al., 2014; Rodrigue et al., 2016; Yuen & Sander, 2017). Interestingly, Katharina et al. (2014) studied cytokinetic processing leading to depression and indicated that cytokines, specifically interleukin (IL-6) and tumor necrosis factor-alpha (TNF-a), are potentially biomarkers for depression, which could provide new treatment assessment options. Finally, GABA, an inhibitory neurotransmitter that reduces neuronal excitability, is decreased during

stress reactive excitation. By reducing GABA's inhibitory effect, other neurotransmitters increase excitation, further exacerbating hyperarousal and allostatic loads (Streeter et al., 2012). Low levels of GABA have been reported as being present in psychological disorders, including PTSD (Streeter et al., 2012). Treatments for GABA deficiencies are being investigated to address a range of psychological disorders (Sue et al., 2016; Streeter et al., 2012).

The sympathetic response occurs in milliseconds; however, one of the most significant contemporaneous problems with this rapid response is that the prefrontal cortex, where most executive functioning occurs, lags behind the amygdala's response (Arnsten et al., 2015; Garfinkel & Critchley, 2015). The amygdala initiates an electrochemical response immediately to ensure the person's rapid safety. The prefrontal cortex on the other hand takes longer to process the situation from a logical construct. Catecholamines (dopamine and noradrenaline), released during stress hinder top-down cognitive functions of the prefrontal cortex, while strengthening the emotional responses of the amygdala (Arnsten et al., 2015; Garfinkel & Critchley, 2015). Wheelock et al. (2018) conducted researched suggesting that stress disrupts the transfer of information within brain regions and increases the centrality of the amygdala, which decreases inhibition of the HPA axis, further confirming the rapid emotional reactivity to stress. This delay in logical reasoning yields a person who is in a heightened emotional state but who has not yet been able to process the danger and its relevance. Additionally, during stress, research has found that the frontal lobe becomes hypoactive, yielding difficulty in differentiating benign stress from emergent stress (Bremner et al., 2017). These effects literally produce a person primed to act before thinking, which in an emergency situation is invaluable; however, most situations humans now encounter are not true emergencies and this delay can cause

emotional reactions and behavioral responses that are not warranted (e.g., an overreaction to being cutoff in traffic).

The biophysiological antidote to the sympathetic response of stress reactivity is the PNS, in which the vagus nerve is centric, helping the body to return allostatic physiological processes to homeostasis (Rodrigues et al., 2016; Yuen & Sander, 2017). The vagus nerve, housing both sensory and motor functions, is the longest of the 12 cranial nerves, stretching from the medulla oblongata to the colon. It is referred to as the interface among the microbiome-gut-brain axis and has been suggested as a potential biomarker of the gut-brain axis and related pathology (Bonaz, et al., 2018). Stress inhibits the vagus nerve, reducing its effectiveness in controlling inflammatory excitation, resulting from cytokinetic activation (Bonaz, et al., 2018). With prolonged exposure to stressors and stress reactivity (chronic longitudinal stress), PNS recovery is blunted, favoring a continued allostatic state, leading to the physiological detriments previously discussed (Bonaz, et al., 2018).

The vagus nerve mediates control of supradiaphragmatic visceral organs, including the esophagus, bronchi, pharynx, and larynx. Additionally, it inhibits defensive limbic circuits and exerts cardiovascular influence by restraining heart rate (Beauchaine, 2007; Porges, 2011; Porges, 2001; Porges et al., 1994). Since the vagus nerve exerts a centric role in regulating the heart rate, Porges suggested that the amplitude of respiratory sinus arrhythmia (RSA) is a suitable measure of PNS activity (2011). This could lead to a biomarker for stress induced disorders.

With PNS activation, the vagus nerve releases acetylcholine, a neurotransmitter, which reduces the excitation produced by the SNS, thereby yielding a calming effect, including improvements in heart rate, blood pressure, respiratory rate, digestive system function, cortisol

levels, adrenaline presence, and inflammation from cytokines (Rodrigues et al., 2016; Yuen & Sander, 2017). Rodrigues et al. (2016) further described the vagus nerve as a bidirectional connector between the brain and immune system that reduces exacerbated inflammation produced by increased presences of cytokines by releasing acetylcholine. Additionally, activation of the vagus nerve elicits higher functioning of the brain regions responsible for cognition and affect (Streeter et al., 2012). Finally, the vagus nerve when activated, has been shown to increases neurotransmitter activity, including GABA, norepinephrine, and serotonin, all aiding in cognitive regulation and homeostatic functioning (Streeter et al., 2012).

Psychoneuroimmunology is an important concept of stress reactivity. Psychoneuroimmunology is the study of the immune and central nervous systems' contribution to psychological health and wellbeing. These systems play a significant role in stress reactivity (Sue et al., 2016; Verma et al., 2011). The link with psychoneuroimmunology and psychological approaches dates back many years; however, research in this area is quite recent from a Western medical standpoint (Cook-Cottone & Guyker, 2018; Sue et al., 2016).

It is now commonly accepted that frequent sympathetic activation of the stress response system can lead to allostatic loads, resulting in numerous chronic health conditions. Chronic stress has been reported as permissive in diseases, including chronic inflammatory diseases, cancer, cardiovascular diseases, endocrinological diseases, irritable bowel syndrome, acute and chronic viral infections, sepsis, and asthma (Bonaz et al., 2018; Straub & Cutolo, 2017; Streeter et al., 2012). Additionally, research has reported that a chronically activated immune system, resulting from the stress activation pathways, interferes with the brain, leading to psychological disorders, depression, dementia, and post-traumatic stress sequelae (Rodriguez et al., 2018; Straub & Cutolo, 2017). Moraes et al. (2018) described psychoneurological pro-inflammatory

response to cytokines (IL-6 and TNF-a) activated by the SNS as including fever, nausea, tiredness, fragmented sleep, depression, irritability, cognitive difficulties in attention and memory, cancer, schizophrenia, anxiety, autoimmune diseases, and HIV/AIDs.

Additionally, psychosomatic and psychiatric disorders have been found to be associated with a dysfunctional HPA axis (Streeter et al., 2012; Verma et al., 2011). The same authors stated that HPA hyperactivity is a common finding in major depression, social phobia, panic disorder, generalized anxiety, obsessive–compulsive disorder, susceptibility to infectious diseases, and cardiovascular disorders. Additionally, hypercortisolism is one of the most consistent biological findings among psychiatric patients with a range of diagnosable disorders.

Hormonal Induced Gender Differences in Stress

Men and women diverge considerably in their hormonal responses to stress (Pooley, et al., 2018; Verma et al., 2011). During stressful reactions, men have higher levels of testosterone and cortisol secretions and more activation in the left amygdala (Goldstein et al., 2010; Olff, 2017; Verma et al., 2011). Conversely, women experience higher levels of estrogen and oxytocin (Goldstein et al., 2010; Olff, 2017; Pooley, 2018; Verma et al., 2011). Oxytocin is particularly important in reducing stress reactivity. Higher oxytocin is a bonding hormone and associated with social support and nurturing (Olff, 2017; Pooley, 2018). Oxytocin has been reported to mitigate amygdala activity, reducing cascading sympathetic activity (Sessa, 2017). Additionally, oxytocin leads to heightened trust and increased abilities to provide social support (Goldstein et al., 2010; Olff, 2017; Pooley, 2018; Verma et al., 2011).

As a result of increased testosterone and amygdala responses, men are more likely to respond to stress with aggressiveness, leading to the traditional fight reaction. Women with higher estrogen and oxytocin hormones lead toward what has been referred to as tend, mend, and

befriend reactions. In part, hormonal differences explain why men are more inclined to react with violence and women with freezing or placating, which serve as a buffer to SNS and HPA arousal for women (Verma et al., 2011). Additionally, researchers have found that men have greater HPA activation compared with women and that dysregulation of the HPA axis increases the risk of stress-related disorders (Stephens et al., 2016).

It is believed that the hormonal differences to stress in men and women serve evolutionary needs (Goldstein, 2010). Goldstein stated that it was important for females (particularly during mid menstrual cycle) to have heightened cortical capacity and lowered excessive arousal, enabling them to ascertain whether a stimulus, such as an approaching male, was an opportunity for successful mating or a threat. In other words, according to Goldstein, females have been provided with a natural hormonal capacity to regulate the stress response that differs from males. This regulatory mechanism was unnecessary from an evolutionary point of view for the male, who had primary responsibility for protection of his social unit, necessitating a fight or flight behavioral response.

Discussion for Section

Stress reactivity, or the fight, flight, or freeze response mechanism, served as a critical factor in evolutionary psychology. Unfortunately, the stress system has not evolved rapidly enough to handle contemporaneous threat stressors. Stressors that most humans face today are not frequently truly emergent, placing one in imminent danger. Instead they are more frequently perceived threats that do not pose life or death risk. Regardless of what the cause of the stress inducing stimulus, stress reactivity over periods of time can lead to substantial psychological and physiological disorders, including PTSD in veterans, which will now be discussed.

Post-Traumatic Stress Disorder

PTSD is the most common psychological condition diagnosed among military personnel and contributes to a wide range of other adverse health outcomes including panic attacks, depression, substance abuse, sleep disturbances, family dysfunction, and occupational impairment (Lukoff & Stozzi-Heckler, 2017). As the DSM-5 reports, PTSD can develop after exposure to one or more traumatic events, involving threatened death, serious injury, violence through direct experience, or being a witness to the event (APA, 2013). This trauma significantly impairs everyday functioning, relationships, and quality of life, often as a result of the impacts of allostatic loads induced by chronic stress reactivity (APA, 2013). Although PTSD starts within one month of the event, symptoms may not appear for years (APA, 2013). Additionally, many co-morbidities may act concurrently with PTSD, including depression, anxiety, and substance use disorders (APA, 2013). PTSD can be considered a maladaptive response mechanism to current life and events, resulting from witnessing a previous traumatic event(s) and is characterized by re-occurring memories of the event(s), avoidance, maladaptive cognitive appraisals, rumination, overall negative affect and cognition, and hyperarousal (APA, 2013; Clausen et al., 2016; Lang et al., 2020).

The DSM-5 sorts PTSD symptoms into four criteria (APA, 2013). First, criteria A, intrusive memories, can include recurring thoughts of the event, nightmares, and severe emotional distress. Second, criteria B, avoidance, can entail conscious suppression of thoughts about the event or eschewing situations or stimuli reminding one of the causal event(s). Third, criteria C, negative changes in cognition and affect, can include negative self-perception, inability to maintain relationships, feeling detached, and anhedonia. Fourth, criteria D, hyperarousal, or changes in arousal and reactivity, can include sleep disturbances, fearful nature,

irritability and anger, self-destructive behavior, guilt and shame, and difficulty concentrating. Additionally, the DSM-5 reports that PTSD may or may not manifest with dissociative states; however, they are reported as being present in 20% of veterans with PTSD and can complicate treatments used and outcomes (APA, 2013; Hansen et al., 2016). The DSM-5 describes two forms of dissociative states in PTSD: (1) Depersonalization: the experience of being an outside observer of or detached from oneself; (2) Derealization: experiencing one's surroundings as unreal, dreamlike, distant or distorted in some way (APA, 2013).

Gindi et al. (2016) indicated that PTSD is framed differently in the DSM-5 and in ICD-10. The ICD's definition places a higher level of emphasis on three levels of responses to traumatic events, including acute stress response (ASR), acute stress disorder (ASD), and PTSD. Clinically, these three diagnoses are similar; however, they differ in severity and predominantly duration. ASR occurs within the first 48 hours of the triggering trauma, ASD occurs between refers two to three months after the trauma, and PTSD occurs when the symptoms linger for more than three months.

Prevalence of PTSD in Veterans

PTSD has been shown to affect 25% of veterans studied, and of those who are wounded in combat, the rate increases to 54% (Badiuk et al., 2016). The Veterans Administration reported PTSD prevalence of 20% from the Afghanistan war, 14% from the Iraqi war, 12% from the Gulf war, and 30% from the Vietnam war (Gradus, 2020). Currently, 22 veterans commit suicide per day, which is over two times higher than the rate of the entire population in the United States (Castro & Kintzle, 2014; Gradus, 2020). Stern (2014) reported that when considering the Afghanistan war that more military suicides occurred than actual combat related deaths. And in

the Vietnam conflict alone, 150,000 veterans have committed suicide since it ended (Badiuk et al., 2016).

Research indicates the possibility that PTSD is underreported in veterans for several reasons. First, clinical identification of PTSD is quite difficult as many veterans will not acknowledge their condition and problems due to military stigma and shame (Fogger et al., 2016; Hamilton et al., 2016; Heath et al., 2017; Paige et al., 2019; Pearson et al., 2020). Stigma toward receiving treatment for veterans is particularly high as many members of the military consider mental health needs to be a sign of weakness, which is not well-tolerated in military cultures nor embraced under a warrior mindset (Barr et al., 2019; Hamilton et al., 2016; Heath et al., 2017; Paige et al., 2019; Pearson et al., 2020). Second, equally challenging is that veterans typically psychologically deny or suppress the originating trauma(s) and circumvent contemporaneous triggers of the originating traumas, leading to avoidance of the symptoms and denial of the need for treatment (Fogger et al., 2016). Third, many veterans will attempt to self-manage their symptoms for years before seeking assistance, which can contribute to the high suicide rate and substance abuse issues among veterans with PTSD (Barr et al., 2019; Hamilton et al., 2016; Heath et al., 2017; Paige et al., 2019; Pearson et al., 2020). Each of these factors must be considered in assessing, diagnosing, and treating veterans who may present with PTSD symptoms or who are at risk for developing them.

Combat Stress Reactivity: An Underlying Causal Factor of PTSD in Veterans

Combat stress reactivity (CSR) is a specific form of acute and chronic stress reactivity that only affects veterans, resulting from the effects of direct combat involvement and is a prevalent causal factor of PTSD in veterans (Badiuk et al., 2016; Gindi et al., 2016). CSR yields a wide range of symptoms, including changes in the following: behaviors, emotional regulation,

and physiological dysregulation, hyperarousal, avoidance, and a decrease in daily functioning (Badiuk et al., 2016; Gindi et al., 2016). The probability of chronic effects of combat stress reaction depends in large part on the severity of myocardial stress exposure and duration of the exposure during direct combat operations, which can be prolonged particularly with the increased rate of multiple deployments seen in more recent conflicts (Badiuk et al., 2016).

Paige et al. (2019) defined four types of CSR triggering traumas that can lead to PTSD, including committing a moral injury, observing a moral injury, threats to life, and traumatic loss. First, committing a moral injury refers to a person having to commit an act to which he/she has ethical objections but still completes as ordered. This produces two traumas as the person committed an act with which they did not agree and also did not object or refuse to complete the act. Second, observing a moral injury means a person watches a colleague commit an act that the person considers unethical and one that they did not attempt to prevent the colleague from committing. Third, threats to life refers to being in a combat situation that could lead to a person's death. Fourth, traumatic loss refers to witnessing the killing of a colleague, particularly a close one. Of the four triggering traumas, committing a moral injury was reported by the authors as producing the most notable PTSD symptomology in veterans; however, interestingly, it did not predict greater use of treatments or continuation once a treatment regimen had been initiated.

Latent Period of Combat Stress Reactivity

Research by Badiuk et al. (2016) provided light on a particularly important concept with PTSD and veterans: the latent period. The latent period is the time between when the last traumatic situation was witnessed and the initial onset of PTSD symptoms. For example, at the conclusion of the Vietnam war, most veterans were tremendously happy to return to their

previous civilian lives and initially showed no effects of PTSD or related co-morbidities; however, once the veterans were confronted with stress producing events of routine life, negativity from society directed at veterans, or triggers reminding them of the war, PTSD symptoms began to present themselves. Badiuk et al. (2016) went on to suggest that this latent period of PTSD is deceptive in nature, as the veteran initially appears well-adjusted with return to normal life, showing no etiology that indicates a potential for PTSD. There are no displays of health maladies, and the veteran's unique previous traumatic experiences appear to be forgotten. Unfortunately, as the veteran returns to former life, the traumatic symptoms eventually begin to manifest. According to the authors, the degree of traumatic regression depends on many factors, including, genetic predispositions, personality factors, social support structures, societal attitudes toward the war time efforts, and perception of the veteran's beliefs about whether their actions were heroic or reprehensible. Key factors influencing adaptation during the latent period include lack of physical injuries from combat, strong financial position, spiritual beliefs, no substance use, maintaining former social status, and most importantly, availability of social support from loved ones (Baduik et al., 2016).

Mindfulness-based preventative measures, discussed later, are shown to be particularly effective for proactively reducing the possibility of PTSD during the latent period. This is suggested to result because they have been shown to help veterans to focus on the present moment, develop self-awareness, and avoid rumination on past traumatic events (APA, 2017; Barr et al., 2019; Cramer et al., 2018; Neukirch et al., 2018; Omidi et al., 2013; Stephenson et al., 2016). This leads to a reduction in hyperarousal and rumination, which can leave veterans feelings trapped in the past traumatic experiences.

Military Handling of Traumatic Events and Latent Period

Gindi et al. (2016) discussed how the military handles CSR during the immediate aftermath of the traumatic event (and the latent period). According to the authors, the goal of the military in dealing with CSR is two-fold. First, a rapid return to healthy functioning is engaged, and second, the long-term goal of preventing the development of PTSD is considered. The authors stated that military doctrine indicates that the achievement of rapid return to functioning (and military duty) positively hinders the development of future PTSD; therefore, return to duty becomes of central importance. The implementation of military treatment protocols for victims of CSR follow the principles of frontline treatment, which were developed in the US military dating back to WWI. This is referred to as BICEPS: brevity, immediacy, centrality, expectancy, proximity and simplicity (Gindi et al., 2016; Hourani et al., 2016; Russel & Figley, 2016; Russel & Figley, 2017). Effective treatment protocols are grounded in personnel remaining in the therapeutic milieu of the military environment. This centuries old approach has been shown effective in in the short term by returning subjects to combat; however, as Russel & Figley (2016) argued, this approach is detrimental to long-term mental health, and often leads to PTSD, counteracting the military's approach to rapid treatment as being important for PTSD avoidance.

Russell & Figley (2017) provided additional research, indicating that the military's approach of rapid return to duty (RTD) is effective in the short term but does not meet the long-term goal of reducing PTSD in veterans. They discussed the military's psychiatric and behavioral health program for returning active military personnel to duty when they have encountered CSR, which is referred to as combat operational stress control (COSC). The detailed concepts behind COSC are beyond the scope of this study; however, it is important to note that it is a century old program based on the BICEPS concept, which focuses on keeping personnel in the battle theatre

and avoiding psychiatric medical evacuations, which can lead to costly life-long disability payments. The authors argued that the COSC program is effective for short term RTD but is detrimental to long term PTSD avoidance, as it does not provide adequate treatments to resolve the negative effects of chronic CSR. In fact, the authors clearly stated that they could find no benefits whatsoever supporting the military's program for preventing long-term negative affects to personnel who have encountered CSR and require frontline treatment.

Additional research by Hourani et al. (2016) supported the concept that additional prevention efforts to reduce PTSD that is not predominantly focused on RTD is warranted. These authors suggested that implementing pre-deployment stress inoculation training (PRIST) can help prevent long term PTSD. The PRIST program helps members of the military handle combat-related trauma and its negative effects by providing the following: (1) education regarding COSC, (2) relaxation training, using breathing exercises, and (3) exposure videos to stressful environments. The program is incorporated before, during, and after deployment.

PTSD and Gender in Veterans

As previously discussed, HPA excitation and subsequent hormonal pathways vary between men and women, leading to altered stress response mechanisms; however, the prevalence of PTSD in veterans is similar between men and women. Interestingly, the causal factors of PTSD do vary. Street et al. (2013) conducted research on 1,207 women veterans diagnosed with PTSD. They noted that women were more likely than men to report sexual harassment from their time in the military. Half of the women reported the experience of non-assault sexual harassment and 25% reported sexual assault, compared to men reporting 11% and 1% respectively. The sexual harassment encountered by the women did not influence the overall PTSD rates, which are the same as for men at 20% (although in the general population women

experience PTSD at twice the rate of men). However, the sexual trauma encountered by some of the study's women is considered a deployment stressor, contributing to PTSD symptomology. Women served in far fewer combat roles than men, so the reason for the equal rates of PTSD is attributed to the influence of sexual trauma being higher for women. Additionally, women were described as having higher risk for depression and men for higher substance use. As a result of this study, it is clearly imperative for the military to address sexual harassment.

Research by Stefanovics and Rosenheck (2020) supported the findings from the Street study. Stefanovics and Rosenheck studied 495 women who were veterans with PTSD and compared them with 2,975 men. Results showed that the women experienced higher rates of co-morbidities than men and that the type of trauma reported by women was more likely to be sexual related traumas while the men showed more combat related trauma. This led the authors to suggest that women experience higher levels of interpersonal trauma in military settings. Finally, authors concluded that although the traumatic etiology was different between men and women, the treatment modalities used are equally effective, apparently not requiring differentiation for men and women veterans who suffer from PTSD regardless of causal etiological considerations. Although treatments can be the same, authors noted that the women demonstrated significantly better results post treatment than the men.

Conventional Treatments for Veterans with PTSD

As a brief contextual background, conventional treatments for veterans with PTSD include psychotherapeutic and pharmacologic approaches. The VA, American Psychological Association, and American Psychiatric Association have reported that conventional evidence-based psychotherapeutic treatments for veterans with PTSD have been shown effective (APA, 2017; APA 2017; VA/DOD, 2017). According to the VA conventional treatments are *strongly*

recommended to be incorporated into treatment for veterans with PTSD, as they do not have any negative effects or contraindications (APA, 2013; APA, 2017; Cramer et al., 2018; Cushing & Braun, 2018; McCarthy et al., 2017; Mehling et al., 2017; Neukirch et al., 2018; Polusny et al., 2015; VA, 2020; VA/DOD, 2017). This includes the following four techniques: CBT, EMDR, CPT, and PET (APA, 2013; APA, 2017; Cramer et al., 2018; Cushing & Braun, 2018; McCarthy et al., 2017; Mehling et al., 2017; Neukirch et al., 2018; Polusny et al., 2015; VA, 2020; VA/DOD, 2017).

First, CBT focuses the subject on changing thinking patterns that are maladaptive into more constructive positive patterns and incorporates behavioral modifications through graduated exposures to the traumatic event that lead to PTSD (Fogger et al., 2016). Second, EMDR is a structured therapy intervention where subjects are guided to recall specific traumatic events and bodily and psychological tensions and stress that are associated (Chen et al., 2014; Fogger et al., 2016). While visualizing the trauma memory, the subject follows oscillating eye movements, which have been shown to reduce hyperarousal, making working memory more effective, leading to effective trauma resolution (Fogger et al., 2016). EMDR has been reported to improve symptoms of PTSD, including anxiety, depression, and emotional distress, hyperarousal, and intrusive thoughts (Chen et al, 2014; VA/DOD, 2017). Some initial research of EMDR suggested that it can make PTSD worse; however, more recent systematic literature review research shows this to be outdates (Valiente-Gomez, 2016). Third, CPT focuses on teaching veterans to reframe negative thoughts about the traumatic experience(s) by re-appraising negative thoughts and incorporating journal style writing techniques (VA, 2020; VA/DOD, 2017). Fourth, PET helps the subject confront previous traumas through in vivo exposure to avoid trauma-related triggers, repeated visualization of traumatic memories, and facilitated education to more effectively

process the related emotions (Fogger et al., 2016; VA/DOD, 2017). During PET, subjects are educated on how to question faulty assumptions and modify repeated maladaptive thoughts, leading to more effective cognitive appraisal and processing (Mitt et al., 2014).

In addition to the psychotherapeutic approaches, two pharmacologic agents in the SSRI class, sertraline and paroxetine, are used that have shown limited efficacy for veterans with PTSD (APA, 2017; Kelmendi et al., 2016; Sue et al., 2016; VA, 2020; VA/DOD, 2017; Vance, 2017). There are also numerous other medications that are included in treating the co-morbidities of PTSD, including anti-depressants and anti-anxiolytics, which have been shown effective (APA, 2013; APA, 2017). Interestingly, there have been no new FDA approved medications for PTSD in over 15 years (APA, 2017; Kelmendi et al., 2017; VA/DOD, 2017). New pharmacologic interventions are surfacing, which include cannabis, MDMA, and oxytocin; however, research is still nascent and warrants further consideration for efficacy with veterans with PTSD (Kelmendi et al., 2016). Finally, the sympatholytic agent prazosin has shown positive results for veterans with PTSD in reducing sleep disturbances and nightmares, but additional research is suggested (Vance, 2017).

Limitations on Conventional Treatments with Veterans with PTSD

Although conventional approaches and psychopharmaceuticals have shown efficacy with some veterans with PTSD, it has been reported that they provide limited benefits for many veterans, yielding high drop-out rates and continued residual symptoms post treatment (Barr et al., 2019; Cushing & Braun, 2018; Neukirch et al., 2018; Stephenson et al., 2016). For example, Steenkamp et al. (2016) found that the commonly used conventional treatments have demonstrated mixed results and that studies of veterans have shown that more than 70% of those engaging in conventional PTSD treatments see no reduction in symptoms or co-morbidities.

Additionally, Lee et al. (2016) conducted a meta-analysis of 55 studies, evaluating conventional treatments for veterans with PTSD, including medications and psychotherapeutic approaches, and found the mean dropout rate of the studies to be 29%. Seppala et al. (2014) found that dropout rates from conventional treatments remain as high as 54.0% for veterans in PTSD in general and up to 62.4% for veterans of Afghanistan or Iraq with PTSD. Other studies have shown that less than 10% of veterans with PTSD complete conventional-based therapies (Mitt et al., 2014; Watts et al., 2014). One additional limit of conventional therapies applies to the 20% of veterans with PTSD who exhibit dissociative psychopathology, which does not respond well to approaches that directly focus the subject on the specific traumatic event(s) encountered (APA, 2013; Hansen et al., 2016).

Finally, of the two SSRIs that are FDA approved, sertraline and paroxetine, results are limited. Less than 30% of veterans with PTSD achieve full remission with front-line pharmacological treatments, and for those who do receive a benefit, weeks are required before any therapeutic results are achieved (Kelmendi et al., 2016). Furthermore, results of co-morbidity related pharmaceutical interventions are reported as being mixed and often leave veterans with significant residual symptoms (APA, 2017; Kelmendi et al., 2016; Sue et al., 2016; VA/DOD, 2017).

Discussion for Section

PTSD in veterans is a complicated disorder with a wide range of symptoms and co-morbidities. One underlying cause of PTSD is the chronic detrimental effects of stress reactivity and associated allostatic loads. Research has shown that conventional treatments do provide effective relief to many veterans with PTSD, and as described by the VA are *strongly* recommended. But more significantly is the large percentage of veterans who find no relief from

their symptoms with conventional treatments. As discussed, studies have shown that up to 70% of veterans do not receive benefits from conventional treatments and many veterans show high dropout rates in treatment (Steenkamp et al., 2016). Avoidance, stigma, shame, and the inability to tolerate trauma-focused approaches are key contributors to the high dropout rates for veterans undergoing conventional treatment (Fogger et al., 2016; Hamilton et al., 2016; Heath et al., 2017; Paige et al., 2019; Pearson et al., 2020). Encouraging veterans with PTSD to learn how to accept thoughts, feelings, and experiences with a present moment, non-judgmental approach can reduce avoidance and rumination, which are key influencers of PTSD symptomology (Polusny et al., 2015).

This systematic literature review now turns to non-conventional treatments shown effective for veterans with PTSD. It has been reported that veterans have shown improvements in their PTSD symptoms when incorporating mindfulness-based practices. For example, Streeter et al. (2012) described how yoga, a mindfulness-based practice, can provide significant improvement to veterans with PTSD. Their research showed that veterans with PTSD exhibit hyperarousal as a result of the prefrontal cortex failing to inhibit overactivity of the amygdala. Mindfulness practices can improve homeostasis of the ANS functioning due to PNS excitation, reducing the symptoms of PTSD and related co-morbidities in part by reducing amygdala hyperactivity (Streeter et al., 2012). Although men and women exhibit divergent hormonal pathways, resulting from stress reactivity, research reports that treatments do not need to be varied, meaning that both men and women veterans with PTSD benefit from the same treatment protocols.

Mindfulness-Based Practices

Although conventional approaches can be effective, as previously discussed, studies have found that they do not provide benefit to all veterans with PTSD (Lee et al., 2016; Steenkamp, 2016). Mindfulness-based therapies have been found effective in isolation or when combined with conventional therapies for PTSD, particularly when the PTSD results from unmitigated chronic stress reactivity pathway engagement experienced by veterans (Barr et al., 2019; Cramer et al., 2018; Neukirch et al., 2018). Bremner et al. (2017, p. 2) provided an informative summary of mindfulness training in general:

> "Mindfulness training exercises are designed to cultivate recognition of these processes in real time. Attention is used to notice whichever thoughts, sensations, and feelings are appearing in awareness, while at the same time retaining the capacity to maintain the focus on these contents, or to redirect attention elsewhere. Recognition of this process, normally disguised beneath life's everyday demands, results in a change in relationship with one's thoughts, feelings, and sensations; rather than attention becoming preoccupied with their content, and trying to change or avoid them, they are recognized as events occurring in the field of awareness and will, by their nature, change. By providing a sense of control in stressful situations and encounters, this less reactive response reduces the likelihood of being overwhelmed by thoughts and feelings and leaves mental space for more creative and less habitual responses."

Mindfulness-based approaches stem from a different contextual framework than conventional approaches. Namely, having veterans confront their trauma directly through conventional approaches in a structured therapeutic setting can be traumatic itself. Instead, by using mindfulness approaches the effects of the trauma(s) can often be mitigated without direct

confrontation of the instigating traumatic memories. This can be particularly effective when dissociative states are present (APA, 2013; APA, 2017; VA/DOD, 2017). Maintaining longitudinal efficacy with conventional trauma-focused treatment can present the veteran with a painful atmosphere, resulting from increased SNS and HPA excitation. This increased stress reactivity can compound the original stress caused by the traumatic event(s), leading to disruption of memory recollection and increased fear, yielding furthered difficulty in treating veterans with PTSD (Schnyder et al., 2015; Feduccia et al., 2019).

Mindfulness-based treatments are designed by concept to reduce stress reactivity retroactively, concurrently, and proactively to help ease cognitive processing of traumatic memories, leading to less fear and more effective treatment outcomes (APA, 2017; Barr et al., 2019; Cramer et al., 2018; Neukirch, et al., 2018). Remaining calm and balanced amid conflict is a mindfulness skill that is not an automatic response, as it is contrary to the evolutionary-based FFF process of priming a person for action. However, calm and balanced reactions can be learned by training subjects how to engage alternative responses to stress reactivity (Lukoff & Stozzi-Heckler, 2017).

One effective approach is through breath training. All mindfulness-based practices share the commonality of concerted breath control, which is an effective antidote to stress reactivity (Greenberg, 2017; Streeter et al., 2012). Breathing is the only autonomic nervous system process that can be voluntarily controlled, providing an easy mechanism to impact the ANS, and most importantly, the PNS. By increasing self-awareness and developing interoceptive skills, breath control is effective in sending messages through the ANS to influence the brain and how it perceives, interprets, and responds to a real or imagined threat (Greenberg, 2017; Streeter et al., 2012). Breathing is a vital aspect of organism survival; therefore, respiration must be attended to

by the body's physiological processes (Streeter et al., 2012). Breathing through mindfulness training has also been shown to reduce cytokine pro-inflammatory causes of stress reactivity induced disorders, by increasing PNS activation (Walsh et al., 2016; Streeter et al., 2012).

A systematic literature review by Cushing and Braun (2018) reviewed 15 research studies on mindfulness-based practices. These included MBSR, meditation, and yoga. Authors concluded that mindfulness-based interventions are effective in improving PTSD symptoms associated with veterans. Additionally, authors found that co-morbidities of depression, anxiety, and sleep quality were favorably impacted by mindfulness-based practices in the studies reviewed.

An additional systematic literature review of 93 studies also found favorable results of mindfulness practices (Tomlinson et al., 2018). Results of the study were detailed in three categories of favorable outcomes. First, mindfulness was shown to be inversely related to psychopathological symptoms, including depression. Second, mindfulness was found to be positively associated with adaptive cognitive processes, including decreased rumination and catastrophizing. Third, mindfulness appears to have a direct relationship with increased emotional processing and regulation.

One additional interesting benefit of mindfulness reported in the literature is the improvement in subject's mindset. A person's mindset refers to core assumptions about events and causes of stress in the environment, which orients the person to a particular schema, including expectations, attributions, and goals (Crum et al., 2017; Greenberg, 2020; Smith et al., 2020). People who embody a *stress is enhancing mindset* have better outcomes with stress and fewer negative physiological and psychological detriments from stress than those who express a *stress is detrimental mindset* (Smith et al., 2020). These researchers studied Navy SEAL

candidates undergoing initial training, which is considered the most difficult military training in the world. They found that students with a positive stress is enhancing mindset performed better under all conditions and were far more likely to complete training. Interestingly, these authors discussed that their research found no correlation to willpower and performance, meaning that forced mental willpower was less effective than embodying a positive stress is enhancing approach in Navy SEAL trainees (Smith et al., 2020). Additional research on mindsets by Crum et al. (2017) supported this concept. They conducted research on 113 subjects and found that when subjects had a stress is enhancing mindset that they had increased positive emotions, greater cognitive flexibility, and developed an increased positive bias toward positive stimuli (positivity led toward more positivity).

By focusing on mindfulness practices, which train a subject to live in the present moment free from attachment and judgement, individuals can learn to make choices with a stress is enhancing mindset. This enables the subject to develop choices between stimulus and response that are more proactive and enhancing, leading to more positive schemas, which in turn can reduce stress reactivity and PTSD symptomology, by reducing or elimination allostatic load dysregulation (Crum et al., 2017; Greenberg, 2020; Smith et al., 2020).

Cognitive-Based Mindfulness Practices

Cognitive-based mindfulness practices focus on a present moment, non-judgmental approach and typically do not involve movement (or have little movement involved). These practices entail psychoeducation of the specifics behind each practice and typically emphasize breath control, which has been shown to increase parasympathetic activation (Streeter et al., 2012). MBSR and meditation are two practices that will now be reviewed, as they are the most frequently researched cognitive-based mindfulness treatment options.

It is important to first note that one misconception is that mindfulness and meditation describe the same action. This is not correct. Harrison provides a standard accepted definition of meditation, which is "To focus continuously on the breath or body in some way" (2017, p. 34). He stated that it is an intentional interoceptive act (2017). In other words, meditation is a planned and deliberate act of releasing thoughts and developing and interoceptive awareness to reduce tension and increase calmness. Kabat-Zinn, the founder of MBSR, provides a commonly referenced definition of mindfulness, which is "The awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding experience" (2003, p. 145). Mindfulness is a continual process a person can use anytime and during any activity (Eisler, 2018). In sum, the specific act of meditation is a mindfulness practice; however, the practice of mindfulness is a continual process and not a specific act (Amen & Amen, 2016; Eisler, 2018; Harrison, 2017).

Mindfulness-Based Stress Reduction Overview

MBSR was brought to Western practice through the work of Jon Kabat-Zinn and the University of Massachusetts (Bremner et al., 2017; Greenberg, 2017). Although not specified, MBSR was originally developed for subjects who were unresponsive to traditional medical intervention (Stephenson et al., 2016). MBSR is a program that helps subjects become more mindful of habitual reactions to stress and how to make adaptive choice between stimulus and response (Baum, 2010). In other words, subjects are taught that they have a brief moment of choice before they react to stress, traumatic memories, or traumatic triggers, underlying PTSD symptoms, and that they have control of their customary habitual responses that are maladaptive.

Traditional MBSR programs entail an eight-week course with a one-day initial retreat (Baum, 2010). Participants receive training in formal mindfulness meditation techniques and the

grounding principles of mindfulness in general. Three guiding principles taught in MBSR include attention, intention, and attitude (Shapiro et al., 2006). First, attention teaches the subject to identify events as they happen contemporaneously, by using data from all senses. Second, intention requires the subject to consciously focus solely on present-moment activities, free from rumination over past or future real or imagined events. Third, attitude necessitates the subject to maintain an inquisitive, non-judgmental approach to focusing on present moment activities, free from attachment.

MBSR has been reported to increase attention and well-being and reduce stress and anxiety (Bremner et al., 2017). MBSR provides improvement in reactivity and avoidance, two prime symptoms encountered by veterans with PTSD (Bremner et al., 2017). MBSR has also been shown to improve subject's sense of internal locus of control and reactivity to their traumatic memories, leading to decreased dysregulated emotions (Bremner et al., 2017). Finally, MBSR has been shown to prevent cognitive rumination on traumatic experiences, and concurrent stress triggers, providing greater relief from PTSD symptomology and co-morbidities (Bremner et al., 2017).

Mindfulness-Based Stress Reduction Research Studies

Releasing attachment to previous trauma is a central component in treating veterans with PTSD. Polusny et al. (2015) studied the effectiveness of MBSR with helping veterans to manage a present-moment, judgement free focus in their lives. Fifty-eight veterans with PTSD were assigned to MBSR treatment, consisting of eight weekly sessions of 2.5 hours each and one day long full session. The veterans were instructed in how to live mindfully in the present moment free from judgement and attachment even when experiencing painful situations or memories. Results were measured with the PTSD Checklist, which authors described as an empirically

supported assessment tool for PTSD symptomology and related co-morbidities of depression. Authors indicated that the MBSR led reduced PTSD symptomology. Results remained constant when re-measured two months post treatment. Authors concluded that MBSR is a suitable treatment for veterans with PTSD and helps to improve present-moment focus.

Rumination and anxiety are two factors associated with PTSD and associated co-morbidities in veterans with PTSD (Bremner et al., 2017; Polusny et al., 2015; Stephenson et al., 2016). Research by Schure et al. (2018) on MBSR and its impact on rumination and anxiety involved 15 veterans with PTSD. Researchers found positive results for subjects by showing decreased rumination and anxiety. Improvements were attributed to MBSR's approach of teaching subjects to consider traumatic memories from the context of curiosity and with a non-judgmental frame. Authors suggested that this allowed subjects to acknowledge the traumas but not to repeatedly dwell on the associated negative emotions or to avoid the trauma and related triggers altogether. Ultimately, this enabled subjects to have the opportunity to relive painful experiences from a new perspective with acceptance while avoiding maladaptive rumination and catastrophizing. Encouragingly, subjects also reported that they developed enhanced internal locus of control and self-awareness, enabling them to recognize their stress reactions and to use breathing practices they learned to avoid hyperarousal altogether. Authors concluded that MBSR appears to be an effective treatment for veterans with PTSD.

Research evaluating associations between mindfulness in general and MBSR programs, involving veterans with PTSD provided further supporting results of MBSR's efficacy. In a study completed by Stephenson et al. (2016) 113 veterans diagnosed with PTSD were evaluated to compare mindfulness with MBSR. Mindfulness was measured with the Five Facet Mindfulness Questionnaire (FFMQ). Researchers found that increases in mindfulness were

associated with decreases in PTSD symptoms, leading to the suggestion that MBSR is an effective treatment for veterans with PTSD. The explanation provided by the authors for the favorable results is that habitual intrusions of past traumatic memories, thoughts, and emotions, combined with anxiety provoking worry about future traumatic experiences, lead to a state of debilitation. In other words, MBSR teaches subjects to maintain a calming focus on the present moment instead of allowing the discomfort associated with ruminating on the past or worrying about the future. Learning to ground oneself in the present can provide relief by breaking historical and future cognitive patters, which leads to additional stress reactivity and maladaptive responses patterns.

Negative mood states and thought patterns of veterans with PTSD have been hypothesized to contribute to emotional instability, making symptoms of PTSD worse (Bremner et al., 2017; Polusny et al., 2015; Schure et al., 2018). To evaluate this, a unique approach of evaluating MBSR was taken by Omidi et al. (2013). Researchers selected 62 veterans with PTSD for the study. 31 received an eight-week MBSR program and the other 31 did not receive MBSR but received TAU, which in this case was psychopharmacologic, incorporating antidepressants and anti-anxiolytics. Results of this study demonstrated that veterans who completed the MBSR program had greater reduced rates of depression, fatigue, negative thoughts, dysfunctional attitudes, and anxiety than those receiving TAU.

Authors attributed the success of MBSR to several factors. First, MBSR leads to an increased relaxation response, which counters SNS activation. Second, MBSR practices positively alter physiological considerations impacting PTSD, including improvements in respiratory rate, heart rate, and hormonal functioning. Third, MBSR leads to increased kinesthetic, proprioceptive, and interoceptive functioning, yielding improved cognitive focus and

self-awareness. Authors concluded that given the results of this study, widespread use of MBSR for veterans with PTSD is warranted.

Brain imaging studies of veterans with PTSD have implicated a circuitry of brain regions that are changed by stress reactivity, including the medial prefrontal cortex, amygdala, and hippocampus (Campanella et al., as cited in Bremner et al., 2017). Specifically, studies have shown that the medial prefrontal cortex (PFC) exhibits deficits in response to traumatic memories and triggers (Campanella et al., as cited by Bremner et al., 2017). In well-cited research, Bremner et al. (2017) focused on actual physical brain changes from PTSD in veterans. To accomplish this, authors studied the effectiveness of MBSR treatments on a group of 26 veterans with PTSD who received eight weeks of MBSR treatments. Researchers hypothesized that MBSR would reverse the PFC deficits, reducing the impact of stress reactivity and PTSD symptomology in veterans.

The study found favorable results from the MBSR treatments with improvements in PTSD symptoms, mindfulness, spiritual well-being, and brain activation, resulting from traumatic memories and triggers. These results remained constant when subjects were re-measured six-months post study. Authors suggested that MBSR leads to improved brain functioning in the PFC, leading to decreased fear activation and stress reactivity in veterans with PTSD. They concluded that MBSR is effective and should be considered for treatment protocols for veterans.

Meditation Overview

Meditation is a mindfulness-based method to relax the mind through focusing on a single act such as breathing, which decreases HPA and SNS activation; thereby, reducing stress reactivity (Harrison, 2017; Turakitwanakan et al., 2013). Meditation can also be described as a

mindfulness practice that focuses mental activity by training the mind to control attention, freeing oneself from historical and future rumination (Greenberg, 2017; Hilton et al., 2017). Hilton et al. went on to define three categories of meditation, including focused attention ("voluntary focusing of attention on a chosen object"), open monitoring ("nonreactive monitoring of the content of experience from moment to moment"), and automatic self-transcending meditation ("absence of focus and individual control or effort") (2017, p. 453).

Ultimately, meditation teaches the subject to identify and understand sensations, thoughts, and events, whether positive or negative, and to develop self-awareness skills, empowering the subject to avoid embodying emotional attachment to the experiences perceived. This results in heightened abilities to process stimuli and improve executive functioning (Luu & Hall, 2017). There are many forms and varieties of meditation; however, they all share the same common structure of mindfully focusing on calm, relaxed thoughts and developing a relaxed state, typically through focusing on the breath, which as previously discussed is a voluntary control channel that increases PNS activity.

Meditation was once considered predominantly a spirituality-based practice; however, it is now supported by considerable empirical research, demonstrating the medical and psychological benefits it can provide, which are free from underlying spiritual connections unless the subject desires to incorporate a spiritual nature into the practice (Harrison, 2017; Lukoff & Stozzi-Heckler, 2017; Turakitwanakan et al., 2013). In other words, meditation has gone beyond being solely a spiritual practice, but if the subject values that aspect, it can certainly be incorporated.

Meditation originated in Hindu and Buddhist practices but was also integral in early Japanese martial art traditions. The Japanese warriors, who frequently dealt with life and death,

learned the meditation practices of peaceful Zen monks to help them develop inner states of mental and physical calmness (Lukoff & Stozzi-Heckler, 2017). More currently, meditative practices are now taught in many military special forces training programs, including Navy SEALs. Specific training practices of Navy SEALs are classified, but through anonymous personal communication with a Navy SEAL commanding officer in May 2020, practices such as boxed breathing and proactive guided visualization were reported as being standard practice. This focus on breathing is also supported by Hourani et al. (2016) through the PRIST program, previously discussed. These types of activities already incorporated in combat units can be important to share with veterans with PTSD, as it can help alleviate potential stigma and misconceptions toward meditative practices.

Meditation Research Studies

In research designed to evaluate the effectiveness of meditation as a general concept, Heffner et al. (2016) conducted a study on 391 veterans with PTSD who were being treated in one of six Veterans Administration Hospitals. The focus of the study was to compare meditative-based treatment to treatments as usual (TAU), which included PTSD education and prolonged exposure therapy. Results showed moderate improvements in the meditation group compared to the TAU group. Researchers stated that this study provides further empirical support for meditation's effectiveness in managing PTSD symptoms in veterans within the VA mental health sector. Authors suggested that further research evaluating how meditation specifically affects avoidance and emotional reactivity is warranted.

Generalized meditation requires subjects to sit in silence with no mental focus on anything in particular. However, this can be challenging for subjects afflicted with hyperarousal or dissociative symptomology, as a result, forms of meditation that are more directive in nature

are effective (Seppala et al., 2014). For example, in a study focusing on a particular form of meditation, Seppala et al. (2014) investigated veterans with PTSD and the effectiveness of breath meditation (BM). Authors believed that by having subjects focus solely on the breath itself that they would be practicing a focused mindful activity, which would alleviate hyperarousal symptoms. The study engaged 21 veterans of the Afghanistan and Iraqi engagements and focused on reductions in PTSD symptomology, anxiety, respiration rate, and physiological startle response (hyperarousal). The study involved a seven-day intervention with one three-hour session per day. The specific practice of BM described by the authors was an intervention focusing on controlled, sequential, rhythmic breathing exercises performed while seated with eyes closed. Results showed decreases in PTSD symptoms, anxiety, respiration rate, and hyperarousal. Authors were particularly encouraged by the reduction in hyperarousal, which they consider to be the most distressing symptom of PTSD in veterans.

The researchers followed up one month and one-year post treatment intervention. Interestingly, they found no correlation between continued practice and additional changes in symptomology; the seven-day intervention provided benefits even without further treatments. Authors attribute the success of the intervention with two predominant considerations. First, BM activates both the SNS and PNS, which enhances subject's alertness while simultaneously proving a calming effect. Second, BM decouples the stimulus provided by recalled traumatic memories from the fear response of hyperarousal states, allowing subjects to re-experience traumatic memories while in a relaxed, calm psychological and physiological state. The authors of this study concluded that breath meditation is an effective treatment for veterans with PTSD, and may in fact, be more beneficial than other forms of mindfulness-based treatments.

In a study focusing on another specific form of meditation, Lang et al. (2020) conducted research on veterans with PTSD by investigating a meditative practice referred to as compassion mediation, which they describe as a reflective practice that focuses on developing compassion for oneself and others. The specific treatments were provided by certified practitioners under cognitively based compassion training (CBCT). CBCT is a compassion meditation-based training program, entailing a proscribed sequence of contemplative practices that are designed to lead to greater compassion toward self and others, which can be effective with veterans suffering from PTSD (Negi 2013 as cited in Lang et al., 2020). The reflective nature of this form of meditation endeavors focus on insights into the way one's mindsets and attitudes can be directed toward an internal locus of control resiliency, enabling the subject to develop a more accurate perception of others. The ultimate goal is to instill informed compassion that is an automatic response through learned repetition.

In their study, 36 veterans diagnosed with PTSD were included. The subjects received eight to ten treatments, lasting between 90 and 120 minutes. CBCT was shown to provide the following additional increased results: social connectedness, altruistic behavior, social cognition and awareness, emotional regulation, coping abilities, ability to mitigate fear-based reactivity, and ability to have empathy for suffering in others. The authors reported that these are all important considerations in symptomology of veterans with PTSD. Results of this study showed statistically significant reductions in PTSD symptomology and depression. Authors attributed the positive results to the self-reported improvements in feelings of peace and calm. Authors concluded that meditation is an effective treatment for veterans with PTSD.

In yet another form of meditation, Kang et al. (2018) completed a study on the more commonly known transcendental meditation (TM). This form of meditation entails coordinating

the breath with the use of a repeated word or phrase called a mantra in traditional meditative verbiage. Authors stated that engaging in a repetitive phrase can help calm the mind by preventing it from wandering to random topics or ruminating on a distressing topic, particularly if that topic involves a traumatic memory for veterans with PTSD. In this study, 29 veterans with PTSD completed eight weeks of individual and group meditative practice by certified TM instructors. Researchers found reductions in PTSD symptoms of avoidance, depression, and somatic tension. Additionally, subjects increased mindfulness and quality of life measures. Gains were maintained two months post study without the presence of additional sessions. Authors attribute the positive results to changes in brain states as reflected in baseline and post treatment electroencephalography (EEG). Authors concluded that TM is an effective treatment for veterans with PTSD and should be considered in treatment options.

Finally, research by Kearney et al. (2013) found additional support for meditative practices by focusing on a form of meditation referred to as loving kindness mediation (LKM). LKM is a meditative practice that focuses on enhancing feelings of kindness and compassion for self and others. In this form of meditation, the subject maintains a seated position and focuses on a specific known person who has a positive influence while simultaneously repeating favorable phrases directed at that person. The intent is to direct feelings of safety, happiness, health, and peace towards that person. Then the subject repeats the practice for him/herself. Finally, the exercise is repeated a third time and is directed at a person who has caused difficulty or harm to the subject. Often this practice is conducted in a group with other veterans with PTSD, which can add to the experience by increasing social contact and empathy with others.

In this study, 42 veterans with PTSD engaged in a 12-week course of treatment within a Veterans Administration hospital. Authors reported that results were favorable as the subjects

had increased self-compassion and mindfulness. PTSD and depressive symptoms were reduced and remained constant when measured three months post treatment. According to the authors, this is a particularly effective practice for veterans with PTSD, as self-criticism, negative rumination, and depression are significant issues, leading to increase symptomology and co-morbid states. Authors stated that they found self-compassion to be inversely related to self-criticism, rumination, anxiety, and depression and positively related to life satisfaction and social connectedness (Neff et al. as cited in Kearney et al., 2013). Authors concluded that loving kindness meditation is an effective treatment for veterans with PTSD and should be considered in individual, or perhaps more ideally, in group settings.

Somatic-Based Mindfulness Practices

Somatic-based mindfulness is an approach that links the mind, body, behavior, and movement into a coherent whole practice (Lukoff & Strozzi-Heckler, 2017; Schwartz, 2018). As Schwartz reports, most psychotherapists focus predominantly on the more traditional concept that mental health is tied to the mind in the brain. Unfortunately, this misses an important concept of mental health, which is somatic stress. Mental stress sensation engages the stress reactivity process, which often leads to somatic-based bodily tension, resulting from cytokinetic induced inflammatory processes (Schwartz, 2018; Streeter et al., 2012). Somatic-based mindfulness treatments include a focus on the mind and body by coordinating kinesthetic movement with mental discipline and breath coordination. This engages the PNS to decrease SNS and HPA excitation, reducing the initiating stress reactivity (Streeter et al., 2012). Additionally, somatic approaches have been shown to expand brain functioning through increased hippocampal density, which decreases with stress reactivity (Streeter et al., 2012) and through the development of increased brain plasticity and neural pathway development

(Schwarz, 2018). These brain developments can help veterans find more adaptive means of reacting to the contemporaneous environmental and traumatic triggers, while simultaneously, enabling more productive pathway formation for memory retrieval and processing, thereby, helping the veteran to find ways to avoid becoming stuck in past behaviors and reaction processes (Schwartz, 2018). Finally, somatic-based mindfulness treatments provide enhanced interoceptive self-regulation by maintaining a focus on the connection of the mind and body, which is particularly valuable when a veteran experiences maladaptive affects (Schwartz, 2018). This leads to a heightened internal locus of control by promoting self-regulation through mind and body awareness (Greenberg, 2019; Schwartz, 2018).

Somatic-based mindfulness movement has benefits for the mind and body and has shown positive results for reducing depression, enhancing well-being, improving memory, and increasing cognitive processing. Somatic exercise has been used as a form of behavioral activation in treatment of depression to increase engagement in activities that improve mood (Mazzucchelli et al., 2010; Streeter et al., 2012). Somatic-based mindfulness practices cause the release of serotonin, norepinephrine, endorphins, and dopamine, which heighten mood, reduce pain, and reduce sympathetic activation. Somatic-based mindfulness activities have also been reported to facilitate neurogenesis (Lukoff & Strozzi-Heckler, 2017).

Yoga and martial arts are two forms of somatic-based mindfulness practices that will now be reviewed. Yoga was selected as it is the most frequently reviewed of the somatic approaches. Martial arts were selected as they have been reported as being particularly effective in veteran populations by reducing treatment stigma, which will be addressed.

Yoga Overview

Yoga is a somatic-based mindfulness approach that coordinates the mind with movement through concentration on the breath, postures (poses), and focused concentration (Staples, 2014). Yoga has shown positive results in reducing symptomology of PTSD and co-morbidities in veteran cohorts (Cramer et al., 2018; McCarthy et al., 2017; Mehling et al., 2017; Neukirch et al., 2018). The yogic physical postures provide improvements in musculoskeletal and mental tension, cognitive attentiveness, interoception, mindfulness, and flexibility and strength (Johnston et al., 2015). Yogic breathing exercises modify respiratory frequency and volume, providing corresponding physical and mental changes along with reduced sympathetic activation (Johnston et al., 2015). For example, Ujjayi breathing is a method of resistance breathing specific to yoga where the practitioners mentally concentrate on constricting the inhalation and exhalation of the breath. Ujjayi breathing increases laryngeal contracture and partial closure of the glottis to restrict air flow, which increases PNS activity, thereby, increasing homeostasis (Streeter et al., 2012).

Additional research has shown that yoga has demonstrated positive results in initiating the vagus nerve to release acetylcholine, which engages the PNS, reducing sympathetic activity, underlying PTSD in veterans (Barr et al., 2019; Greenberg, 2019). Streeter et al. (2012) provided additional support that yoga: (1) ameliorates underactivity of the PNS system GABA by stimulating the vagus nerve, and (2) reduces allostatic loads imparted by stress reactivity, returning the body to homeostasis. Finally, decreased cortisol levels have been demonstrated as a significant byproduct of incorporating yogic practices (Streeter et al., 2012).

Yoga Research Studies

Yoga has been reported to reduce the negative effects of sympathetic activation. In a comprehensive research review, Pasco et al. (2017) conducted a meta-analysis on 42 studies that evaluated the effectiveness of yoga. The researchers found that when subjects practiced yoga, they had reduced cortisol levels, lower ambulatory systolic blood pressure, lower resting heart rate, lower high frequency heart rate variability, improved fasting blood glucose, and more favorable cholesterol and low-density lipoprotein. The authors concluded that yoga practices appear to improve SNS and HPA regulation, leading to decreases levels of stress and better overall outlook.

Increased interoception, or mind-body awareness, has been reported as a strong benefit of yoga practices (Johnston et al., 2015). In exploration of this concept, one study compared one group that practiced yoga for eight weeks along with a control group that did not do yoga (Neukrich, et al., 2018). The researchers found that the participants who followed a yoga routine showed increased interoceptive functioning believed to help subjects process trauma symptoms more effectively. This interoceptive benefit lead to significant decreases in PTSD symptoms and co-morbidities, including depression, anxiety, and stress among participants. This resulted from heightened awareness, leading to greater efficacy to self-regulate emotions and somatic sensations, while learning to mindfully focus on the present moment. The authors believe that this allowed the subjects to process traumatic symptoms without becoming overwhelmed by SNS increases and hyperarousal, leading to avoidance or suppression. Additionally, by practicing yoga proactively, the poses themselves exhibit a carry-over effect to other situations. By learning to mindfully concentrate on a pose a correlation can be established to focus on any task at hand. This combined with the interoceptive qualities of yoga is quite beneficial for reducing

sympathetic reactivity stored somatically in veterans with PTSD (Greenberg, 2019; Cramer et al., 2018; McCarthy et al., 2017; Mehling et al., 2017; Neukirch et al., 2018).

In addition to interoception, yoga has been described as proving increased levels of mental and physical calmness (Johnston et al., 2015; Staples, 2014). Support for yoga's ability to improve inner calmness was studied by West et al. (2017). They conducted research on 31 subjects by having them follow a 10-week yoga program. They found that yoga provided the following benefits: helping to experience emotions safely, instilling feelings of safety and comfort, enhancing cognitive appraisal, broadening perception of choices, and furthering feelings of calm, all of which are beneficial for helping veterans to find relief from PTSD and related co-morbidities. According to the authors, these benefits provided by yoga led the subjects to develop an inner power to make choices and gain control over their lives; develop strong relationships with others; accept themselves without as much judgement; and foster a sense of inner calm.

Hyperarousal is a symptom of PTSD in veterans that can be particularly problematic. Staples et al. (2013) studied the effects of yoga on hyperarousal in research that involved 12 veterans with PTSD who completed six weeks of yoga for a total of 12 sessions. The focus of this study was to evaluate if improvements in hyperarousal and sleep occurred upon conclusion of the program. Authors believed that sleep disturbances are particularly common in veterans with PTSD and are believed to underlie many physiological and psychological issues faced by veterans. Hyperarousal symptoms are stated to underlie most PTSD symptoms and co-morbidities, accounting for a portion of PTSD severity.

Results showed clear reductions in hyperarousal, improvement in sleep duration and quality, and improved daytime dysfunction related to sleep deficiencies. The yoga intervention in

this research strived to improve mental focus, peace, calmness, self-awareness, and present moment emphasis. The authors concluded that by learning these skills veterans can develop an enhanced internal locus of control, enabling them to take control of their thoughts and emotions, increase feelings of safety, and decrease stress overall, which are all needed outcomes for veterans with PTSD. These findings lead the authors to conclude that yoga is an effective, low-cost program to which veterans with PTSD show strong adherence, and as a result, yoga can be effectively used with veterans with PTSD.

Additional support for using yoga for veterans with PTSD was provided by as study that, in part, evaluated yoga's effect on improving the functioning of the neurotransmitter GABA, leading to reduced sympathetic activation (Johnston et al., 2015). Researchers conducted a study on 12 veterans with PTSD with a 10-week yogic program. After the 10 weeks, research results included a statistically valid reduction in PTSD symptoms measured by the Clinician Administered PTSD scale (CAPS; $t = 2.822$; $p = .09$). According to the authors, yogic practices help veterans to reduce, interrupt, and reframe the stress, arousal, and avoidance symptoms of PTSD by initiating parasympathetic responses, countering the fight, flight, or freeze mentality many veterans embody. This is accomplished by yoga's ability to down regulate SNS and HPA excitation and increase the veteran's present moment focus, including mindfulness aspects of nonjudgmental awareness and acceptance, which are often lacking in veterans with PTSD. The mindfulness and stress reduction skills a veteran can learn from yoga contribute tools that can be used to alleviate traumatic symptoms through a mindset of acceptance rather than avoidance, denial, or dissociation. Johnson et al. also stated that yoga increases GABA presence. Decreased GABA presence contributes to PTSD symptoms and co-morbidities, namely depression and suicide as it leads to increased hyperarousal (Streeter et al., 2012).

Based on results of the study, Johnston et al. concluded that yoga is a feasible, safe, and effective treatment for veterans with PTSD. One important note is that this study (and other similar studies) were for limited periods of time. Even with the limited duration of the study, results were quite favorable and remained constant over time. As the authors noted, yoga is not intended to be episodic, but long -term in nature. They suggest that more studies are needed in order to track the long-term effects of yogic practices.

Martial Arts Overview

Martial arts are a large group of somatic-based practices that engage and blend the mind, body, and spirit through mindful movement. There are many different styles of martial arts, including aikido, Brazilian Jiu Jitsu, Judo, Karate, Kenpo, Krav Maga, Kung Fu, Muy Thai, Taekwondo, and Tai Chi to name a few. Although there are many different styles of martial arts, they all embody two central core principles. First is the internal or cognitive aspect, characterized by more relaxed movements with a mental and spiritual focus that is meditative in nature (Rios et al., 2017). Second is the somatic or "hard" skills, characterized by dynamic physical movements (Rios et al., 2017). Martial arts have been demonstrated to improve physical, cardiovascular, and psychological health and are supported in being effective for reducing stress reactivity (Rios et al., 2017).

Martial Arts Research Studies

As described, martial arts have been reported to provide many overall psychological and physiological benefits to veterans with PTSD. Martial arts may also be particularly valuable as veterans may have lower stigma to practicing a martial art than committing to more conventional mental health treatments. To support these concepts, Rios et al (2017) conducted a systematic literature review of 28 studies, considering multiple martial arts, including Taekwondo, Karate,

Kung Fu, Kickboxing, Judo, and Soo Bahkdo. The researchers found the following consistent benefits provided by martial arts: improved balance, heightened cognitive functioning, improved musculoskeletal functioning, and improved cardiovascular fitness. First, balance entails the complex processing of mechanical, sensory and motor stimuli, which influence postural control (Leong as cited in Rios et al, 2017). The martial arts in this study used kicking, punching, shifting weight, and spending time on one leg at a time, which contributed to the improvement in static and dynamic balance. Second, cognitive functioning compared to control groups was reported with significant improvement in mood, self-esteem, self-efficacy, self-awareness, emotional health, depression, and quality of life scores. Third, musculoskeletal changes were reported as positive, including increase muscle mass, strength and endurance; decreased weight in overweight subjects; and increased bone mineral density. Fourth, cardiovascular health, was improved for those who were sedentary prior to beginning a martial arts program. The authors suggested that, given their findings from the 28 studies, that martial arts, of any style, show dramatic benefits in psychological and physiological benefits while simultaneously posing low risk injury, which makes this somatic practice effective for all populations, including veterans with PTSD with underlying stigmas toward treatment.

Turning to studies on specific martial arts, Lukoff and Stozzi-Heckler (2017) studied Aikido and found it to be particularly effective for veterans suffering from PTSD. Aikido is a mindfulness-based practice that incorporates meditation and breathing techniques, and like all martial arts, requires that mental focus and physical movement be coordinated. In addition, it is a compassion practice, providing spiritual perspective and social interaction, which the authors stated are important components in treating veterans with PTSD who often lack these aspects.

The researchers, using the Kentucky Inventory of Mindfulness Skills (KIMS) and the Mindfulness Attention Awareness Scale (MAAS), studied the effects of Aikido on subjects. Results showed that Aikido led to greater levels of mindfulness and stress reduction. Researchers followed the subjects through their continued practice of Aikido and found that the longer Aikido was practiced, the greater the levels of mindfulness that were achieved, making it a practice that can be incorporated indefinitely. These authors found that Aikido provides beneficial mindful movement, which engages the PNS, thereby, reducing stress reactivity.

Additional support for Aikido comes from a study by Weiss et al. (2011). In this study, 39 women diagnosed with PTSD participated in Aikido martial arts training along with 7-weeks of cognitive behavioral therapy. The aikido group were compared with 61 subjects who received CBT but no Aikido. Pre-treatment variance between the two groups was reported as insignificant; however, post-treatment differences were noted, as the Aikido group showed a significant decrease in PTSD symptoms as measured by the Posttraumatic Stress Disorder Checklist and in depression as measured by the Beck Depression Inventory II than the group that only completed CBT.

Benefits from other specific martial arts have also been found favorable for veterans with PTSD. For example, Willing et al. (2019) conducted research on Brazilian Jui Jitsu (BJJ). BJJ is a popular martial art that focuses on grappling and ground fighting. In this study, 29 men with PTSD practiced BJJ for 40 sessions over the course of five months. Veterans in this study had clinically significant improvements in symptoms of PTSD as determined using the PCL-5 and the PTSD subscale of the PDSQ self-report questionnaires. The PCL-5 checklist is self-administered scale and identifies PTSD symptoms. The PDSQ provides a global assessment of psychopathology, measuring 13 psychological disorders, including PTSD, major depressive

disorder (MDD), generalized anxiety disorder (GAD), and alcohol abuse/dependence (AAD). The authors suggest that given the magnitude of the results demonstrated that BJJ may be a beneficial approach for the treatment of PTSD in veterans.

Finally, there is extensive research on Tai Chi. Tai Chi is an ancient Chinese martial art that incorporates slow, gentle movements and diaphragmatic breathing. Like all martial arts, Tai Chi is also a somatic-based mindfulness practice, focusing on breathing, relaxation and coordinated movements (Niles et al., 2016). Wang et al. (2014) conducted a systematic literature review and meta-analysis of 42 studies on the effects of Tai Chi, including 27 from English databases and 15 from Chinese. The researchers found that in all studies reviewed Tai Chi was beneficial for alleviating common symptoms and co-morbidities of PTSD, including depression, anxiety, stress reactivity, immune disorders, cardiovascular health, and musculoskeletal pain.

Authors suggested that Tai Chi provides several benefits to veterans with PTSD. First, symptoms of PTSD can represent obstructed somatic energy that prevents natural healing and traumatic resolution, which Tai Chi releases. Second, veterans with PTSD frequently have poor well-being, self-esteem, and interpersonal relationships that Tai Chi is shown to help. Third, Tai Chi appears to reduce dissociative symptoms common in PTSD veterans as they are taught to focus on the present moment and increase interoceptive awareness. Fourth, with practice over time, Tai Chi appears to help veterans to become more confident and develop improved self-control. Fifth, subjects reported looking forward to the sessions, which gave them a sense of hope and purpose along with a social opportunity with other veterans. Finally, studies reviewed suggested that Tai Chi engages parasympathetic activity, reducing SNS and HPA excitation.

In additional specific research, showing the benefits of Tai Chi, Niles et al. (2016) conducted a study, involving 17 veterans with PTSD who completed just four initial Tai Chi

offerings. 77% of the subjects completed the sessions and reported positive results from the sessions. Researchers found that Tai was helpful for alleviating symptoms, including intrusive thoughts, concentration difficulties, and hyperarousal. All subjects stated that they would continue with Tai Chi and would recommend it to others. Quite importantly, veterans in the study indicated that Tai Chi tapped into their *warrior spirit*, which reduced the stigma that many veterans have toward obtaining mental health treatments, providing positive outcomes and a greater likelihood of continued adherence to the treatment. The authors concluded that Tai Chi is a safe and effective treatment for veterans with PTSD of any physical ability or limits.

Discussion for Section

Research reviewed in this systematic study provides a clear theme that cognitive and somatic-based mindfulness approaches provide favorable reductions in PTSD symptomology and co-morbidities for veterans with PTSD. Specifically, MBSR, meditation, yoga, and martial arts have been empirically demonstrated to provide positive results in veterans with PTSD as compared to control groups and TAU. Among the four approach categories studied, benefits are focused on parasympathetic activation and are derived from the following improvements: psychological and physiological return to homeostasis, improved interoception, decreased rumination, reduced hyperarousal, increased self-esteem, increased internal locus of control, reduced stigma for treatment, and increased social connectivity.

To summarize, a systematic review of 42 studies by Moraes et al. (2018) showed that non-conventional interventions of mindfulness-based practices, including yoga, tai chi, and meditation provided significant results to subjects with PTSD. Authors reported defined improvements in all studies with neurological and immunological variables, including cortisol, epinephrine, norepinephrine, and cytokines (IL-6 and TNF-a), which significantly improved

stress, depression, fatigue, sleep, and quality of life. This review was not specific to veterans with PTSD; however, it provided further support of mindfulness-based treatment efficacy in subjects suffering from PTSD symptomology, including veterans.

Theoretical Framework

PTSD is a complicated disorder that shows multi-faceted etiology, involving all causal influences from Bronfenbrenner's biopsychosocialcultural model (APA, 2013; APA, 2017; Tudge et al., 2017; Velez-Agosto, 2017). The theoretical focus of this SLR is directed at mindfulness-based best practices. These practices are one component that psychotherapists can consider as part of a comprehensive, holistic treatment for veterans with PTSD that embraces all aspects of the biopsychosocial etiology and treatment, including pharmacologic interventions, genetic predispositions, conventional therapies, and social support networks of other veterans (and non-veterans). In order to focus on mindfulness-based practices this doctoral project engages the theoretical framework of mindfulness-to-meaning theory (MTMT), as proposed by Garland and colleagues (2015a; 2015b). As a result, the mindfulness-based concepts reviewed in this study will be analyzed through the theoretical framework of MTMT.

This MTMT framework is designed to help subjects, in this case veterans with PTSD, to re-align cognitive processes. MTMT suggests that this re-alignment will enable veterans to reduce rumination, develop an internal locus of control, and focus on the present moment. Ultimately, this allows veterans to free themselves from perpetual, limiting historical traumatic memories and painful stimuli (Garland et al., 2015a; Garland et al., 2015b). Under MTMT, mindfulness is designed to generate cognitive appraisals through interoception. This can lead to a transition from rumination of negative life experiences to the embodiment of more positive constructs (Garland et al., 2015b).

As previously discussed, many veterans live in a state of perpetual fear, have high levels of hyperarousal, and would benefit from the development of internal self-worth to transcend their historical trauma(s). This component of transcending from fear to a Maslow type of self-actualization is an important concept conveyed by MTMT and lends itself well as a theoretical underpinning of this doctoral project. Additionally, MTMT advocates for a positive focus on mindfulness. Garland et al. stated that frequently mindfulness-based programs in contemporary therapeutic practices focus on extinguishing maladaptive patterns, which is important; however, they neglect to cultivate adaptive patterns and positive cognitive states, which the authors suggested results in more effective lasting change (2015b). Finally, Garland considers the concept of hedonic versus eudaimonic well-being. Hedonic well-being refers to happiness derived from pleasurable sources or the avoidance of painful ones. Eudaimonic well-being is focused on transcending from historical rumination to a life of purpose, meaning, and positive engagement. Through a mindfulness-based practice, leading to cognitive re-appraisal through guided thought, feeling, and action, a veteran can generate a flourishing life, embracing eudaimonic meaning. Garland et al. (2015b, p. 298) summarized MTMT:

> "Mindfulness-to-meaning theory, which asserts that by modifying how one attends to the cognitive, affective, and interoceptive sequelae of emotion provocation, mindfulness introduces flexibility into the creation of autobiographical meaning, stimulating the natural human capacity to positively reappraise adverse events and savor the positive aspects of experience. By fostering positive reappraisals and emotions, mindfulness may generate deep eudaimonic meanings that promote resilience and engagement with a valued and purposeful life."

By helping veterans to embrace mindfulness-based treatments through a framework grounded by MTMT, it may be possible for them to release traumatic rumination, develop a more positive outlook, and achieve greater success with conventional treatments as strongly recommended by the VA.

Summary

Stress reactivity is a significant contributing factor to PTSD etiology in veterans. Traumatic events lead to SNS and HPA excitation, producing cascading hormonal and physiological pathways. From an acute standpoint, stress reactivity can provide life-saving benefits to emergent stressors; however, when stress reactivity is engaged in the presence of stressors that are not emergent for periods of time, it can lead to detrimental psychological and physiological allostasis. This results in numerous chronic and debilitating disorders, including PTSD in veterans.

PTSD in veterans is increasing, as are related co-morbidities, including suicide. A range of effective conventional treatments exist for veterans with PTSD, including psychotherapeutic and psychopharmacologic. These treatments have been found effective in treating the symptoms of PTSD for many veterans. However, it has been estimated that 70% of veterans find no symptomatic relief from conventional treatments alone and only 10% of veterans complete treatment protocols, leading many to suggest that conventional treatments are not sufficient. Mindfulness-based treatments have been shown effective and are warranted for treatment of veterans with PTSD in isolation or when combined with conventional-based treatments (Steenkamp et al., 2016).

As a result, mindfulness-based treatment protocols are becoming much more frequent and accepted for treating veterans with PTSD. Cognitive-based and somatic-based treatments all

embody a focus on maintaining a present moment, non-judgmental approach to dealing with stressors and life situations. The four treatments studied in this systematic literature review of MBSR, meditation yoga, and martial arts, have each shown significant results in improving PTSD symptoms and associated co-morbidities in veterans with PTSD, making them effective for incorporation into psychotherapy. Finally, mindfulness-based practices are effective by themselves, but they can be particularly symbiotic with conventional approaches. For example. Harrison (2017) reported three attributes of mindfulness that support CBT and flow from the MTMT theoretical framework. First, learning a present moment focus and identifying thought patterns can aid CBT by enabling the veteran to recognize maladaptive thoughts and behavior patterns. Second, it is common for veterans with PTSD to avoid, resist, dissociate, or suppress painful memories and thoughts; however, when this occurs rumination increases, which Harrison coined the *negative affect tolerance.* A core principle of mindfulness is to accept thoughts without resistance, free from judgement, which avoids the negative affect tolerance. Third, the relaxing state provided by mindfulness practices yields a calmer mind, allowing the person to learn acceptance, self-awareness, and internal locust of control. Each of these three attributes of mindfulness blend well with the goals and approach of CBT, and support the guiding theoretical framework underlying this doctoral project.

CHAPTER THREE

METHODOLOGY

PTSD can occur in any population, demographic, or cohort (DSM-5, APA, 2013). However, this doctoral project narrows its scope to veterans who have been diagnosed with PTSD utilizing DSM-5 criteria. Veterans with PTSD can face many daily and life-long difficulties. As discussed in Chapter Two, these are characterized by fear, hyperarousal, rumination, physical health problems, and substance use disorders, making their lives stressful existences. The resulting dysfunction in veterans' lives further compounds the symptoms and co-morbidities of PTSD, creating a viscous cycle (APA, 2013; VA/DOD, 2017).

Although numerous conventional treatments for veterans with PTSD exist, and several have been *strongly* recommended by the VA (as previously discussed), many veterans do not complete treatment or do not receive relief from symptomology (Barr et al., 2019; Cushing & Braun, 2018; Holmes & Snape, 2019; Neukirch et al., 2018). The focus of this doctoral project was to consider current available research that exists on non-conventional treatments, namely mindfulness-based practices that have shown efficacy in treating veterans with PTSD. The method to complete this focus utilized a qualitative systematic literature review (SLR).

The SLR reported in Chapter Four reviewed mindfulness-based treatments in two categories, including cognitive-based and somatic-based treatments. The goal of the SLR was to address the four stated research questions of the doctoral project. The treatments considered were mindfulness-based stress reduction (cognitive-based), meditation (cognitive-based), yoga (somatic-based), and martial arts (somatic-based). These four mindfulness practices were selected due to the large number of empirical research studies on them in populations of veterans with PTSD. Specifically, in this chapter, the following topics will now be discussed: the research

questions, research method, study participants, instrumentation, methods of data collection, and data analysis. Additionally, throughout this chapter the rationale for selecting a SLR as the guiding framework will be incorporated.

Research Questions

The purpose of this doctoral project was to conduct a qualitative systematic literature review, summarizing selected best practice cognitive and somatic-based mindfulness treatments showed to be effective in helping veterans to find relief from PTSD and common co-morbidities. The SLR was completed through the theoretical framework of mindfulness-to-meaning theory as discussed in Chapters One and Two. Ultimately, these best practices when implemented alone or with other conventional treatments may help reverse the negative trend of increasing PTSD and suicide in veteran populations. Research questions to be addressed in this systematic literature review included the following four inquiries:

Research Question One. How do mindfulness-based treatments, in general, reduce stress reactivity in veterans diagnosed with PTSD?

Research Question Two. What aspects of cognitive-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans?

Research Question Three. What aspects of somatic-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans?

Research Question Four. What recommendations are supported for implementing mindfulness-based practices into psychotherapy for veterans diagnosed with PTSD?

Research Method

Initial literature searches highlighted that extensive research exists on mindfulness-based practices for veteran populations with PTSD. As a result, it was hypothesized that practicing

psychotherapists would benefit from a SLR, informing them as to what mindfulness-based treatments would be beneficial to include in therapy. This was the prime reason for selecting an SLR for this doctoral project, as SLR's have been described as well-suited for synthesizing large numbers of studies. As stated by Liberati et al. (2009):

> "A systematic review attempts to collate all empirical evidence that fits pre-specified eligibility criteria to answer a specific research question. It uses explicit, systematic methods that are selected, thus providing reliable findings from which conclusions can be drawn and decisions made."

Thus, such a review was considered to be meaningful for this area of research because it can: (1) identify therapeutic modalities overlooked in research that may be beneficial, and (2) identify and synthesize potentially efficacious therapeutic methods that practitioners can incorporate (Liberati et al., 2009; Schnyder et al., 2015). An SLR served the purpose of this study more effectively than either a qualitative or quantitative study as there was already a substantial number of studies conducted. The main focus of this doctoral project was to summarize the findings into meaningful information for practicing psychotherapists to use with veterans with PTSD. The four research questions defined provided the framework for conducting the literature search and review. By using a systematic literature review methodology, the research focus was to collect information and draw inferences that can be generalized. This provided categories and patterns that were summarized into overarching themes, underlying the four research questions. By considering current research that provides insight into the research questions, effectiveness of mindfulness-based treatments and suggestions for practicing psychotherapists were formulated, as described in Chapters Four and Five. Ideally, results from this SLR will lead to better treatment outcomes for veterans suffering from PTSD.

Research methods guide and control the means of data collection, analysis, and interpretation, ensuring bias free analysis (Creswell & Creswell, 2018). In other words, research methods are systematic procedures for collecting, reviewing, and summarizing data that simultaneously prevent researcher bias from skewing results. The methodology utilized for this doctoral project was based on PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses), as discussed by Liberati and colleague (2009). The most updated PRISMA guidelines were incorporated, which are discussed in later sections of this chapter.

Participants

As the method for this doctoral project was a SLR, there were no study participants directly involved. The studies that were considered in the SLR only included veterans of the United States military who have been formally diagnosed with PTSD per DSM-5 criteria. Additionally, all participants in the studies selected were of age to be in the military (18 and over). Research was only considered for veterans with PTSD in the United States military. Non-English literature research was not included. Only PTSD research specific to veterans was included unless otherwise noted. Only studies of veterans of the Vietnam War and after were included. Finally, research selected focused on mindfulness-based practices, either cognitive or somatic, that have been studied in populations of veterans with PTSD.

Instrumentation

This doctoral project did not draw information from qualitative or quantitative hypothesis-based experimentation. In other words, surveys, questionnaires, control groups, and experiments were not utilized, rather the information gleamed from the SLR itself was considered the main instrumentation from which relevant inferences were drawn (Creswell & Creswell, 2018; Liberati et al., 2009). As a result, the instrumentation used in this systematic

literature review included the information sources, the electronic databases, and PRISMA guidelines. The PRISMA guidelines are designed to provide structure to a SLR, ensure that applicable literature is reviewed, assist in identifying gaps in current literature, and increase the usefulness of findings, which have been oftentimes considered of poor quality (Liberati et al., 2009). Additionally, it is important to follow this structured approach to prevent researcher bias from entering into the data analysis itself and to follow the guiding principles of the theoretical framework discussed in Chapters One and Two (Liberati et al., 2009).

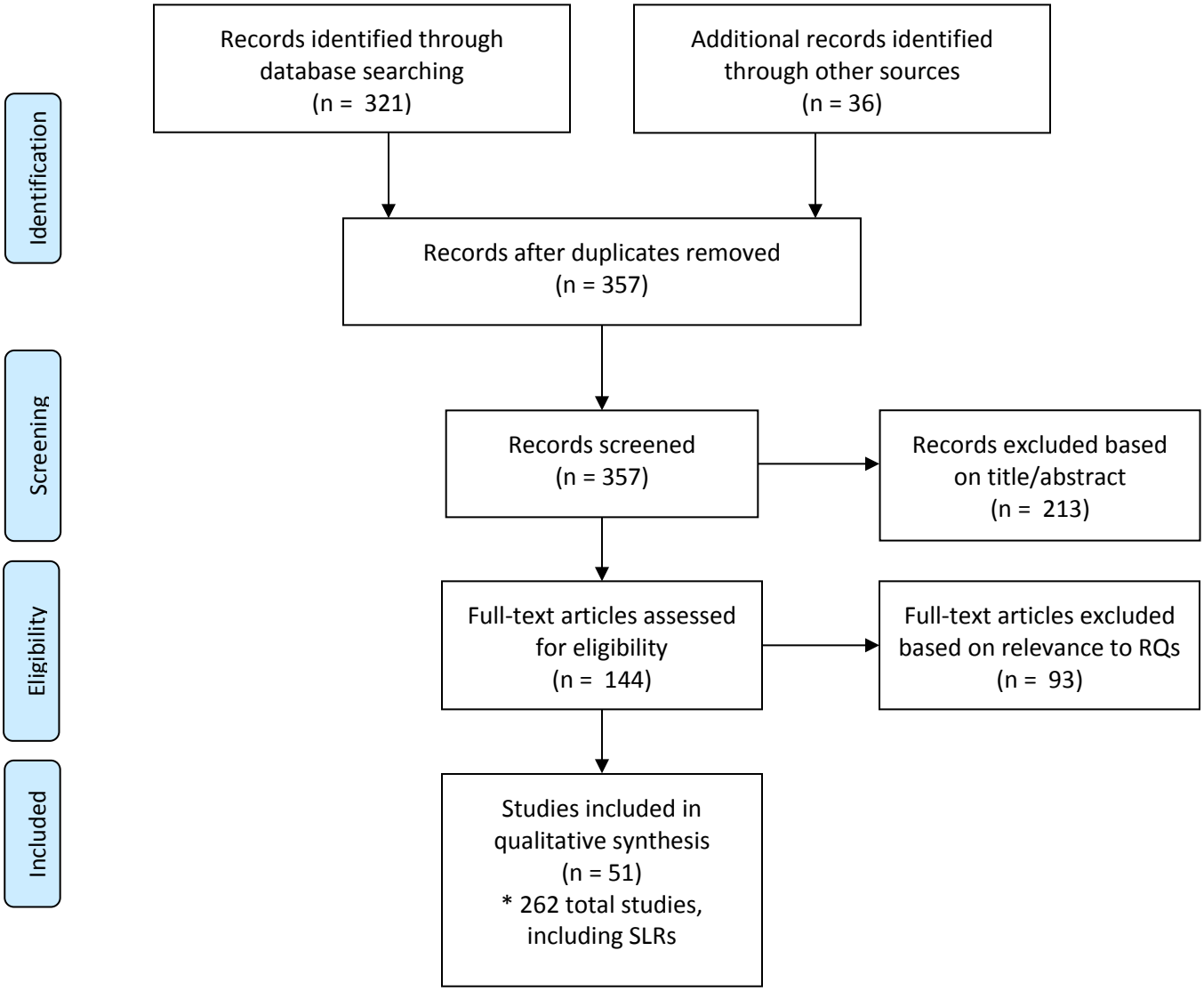
Data Collection

Six steps of the PRISMA guidelines were utilized including the following: conduct database search, identify terms, determine inclusion and exclusion, collect literature, remove duplicates, and review and analyze (Liberati et al., 2009). First, a database search was conducted by using the California Southern University online search engine. This included EBSCO Host, ProQuest Med Search, Google Scholar, and American Psychological Association databases. Additionally, the DSM-5 was used for background information and diagnostic components of PTSD (APA, 2013). Second, terms were identified, which included the following: *mindfulness, mindfulness-based stress reduction, stress reactivity, conventional treatments, cognitive behavioral therapy, eye movement desensitization reprocessing, cognitive processing therapy, prolonged exposure therapy, VA strongly recommended treatments, hyperarousal, symptoms, mindfulness-to-meaning, rumination, depression, military stigma, military shame, MBSR, suicide, martial arts, yoga,* and *meditation*. The conjunction *and* along with *PTSD in veterans* was added to all searches to remain within the parameters discussed earlier for this SLR. For example, one search was *meditation and PTSD in veterans*. Third, inclusion and exclusion criteria were determined. In other words, the articles were reviewed to determine their relevance

to this study, based on the criteria described above in the participants section. Research predominantly targeted the last five years (2015-2020) to ensure that the most current research was considered; however, the publication date was relaxed to within ten years, when too few articles resulted for a given search. Research was sourced from peer-reviewed academic journals. Fourth, the actual literature collection occurred, which was the heart of the data collection process overall. PRISMA guidelines were followed, which included the following requirements, as delineated by Liberati et al. (2009): articles focused on research interests, research was from peer reviewed, reputable journals, articles had sound theoretical foundations, research was ethically conducted, research was in English, and research was withing the last five years unless older articles were required to bridge gaps. Fifth duplicate research was removed. Upon completion of the literature search, the research was categorized, and duplicates were discarded. Sixth, review and analysis of final research occurred; this is described in the next section.

There were 321 articles identified from database searches. A total of 51 relevant research articles, published within the last 10 years, were selected for SLR inclusion. Of these 51 articles, six were SLR's themselves, which included 262 studies. As a result, 313 total studies were included in this SLR. The average age of the final 51 SLR literature search articles were four years old, meaning that the SLR goal or evaluating research within the last five years was met. Selection of the 51 articles occurred by applying PRISMA guidelines to control for bias and relevance. The variance between the number of articles selected (51) and the number of articles reviewed (321) resulted from following the PRISMA flow and selecting articles based upon their specificity to the four research questions. The PRISMA flow used for this project is summarized in Figure 1, which incorporates the number of articles considered in the review.

Figure 1
Systematic Review PRISMA Flow Diagram



Data Analysis

The research selected via PRISMA guidelines was reviewed within the context of addressing the doctoral project's four stated research questions. Categorical data was captured, which included the following: author, date, type of study framework (mindfulness, somatic, cognitive, biological, stigma, or combinations), primary study focus, research question supported, and underlying themes. After compiling the final list of studies to be used, they were studied and analyzed from within the context of these categories. Common themes were sought and categorized for further assessment for each research question. This analysis provided the basis from which recommendations for practicing psychotherapists were made. In summary, the process specified in this chapter is guided by PRISMA and the categories of data to be collected. This process enabled the four research questions to be addressed. Simultaneously, it incorporated controls established to prevent research bias from skewing results. This process provided an analysis of which aspects of mindfulness-based practices were suggested to be most effective in reducing symptoms of PTSD in veterans with PTSD and how psychotherapists can incorporate best practices into treatment protocols, which are discussed in Chapters Four and Five.

CHAPTER FOUR

RESULTS

As discussed in detail in Chapters One and Two, PTSD affects approximately 20% of veterans overall (Kelmendi et al., 2017). Conservatively, 22 veterans commit suicide per day, which is twice the rate of the general population (Castro & Kintzle, 2014; Gradus, 2020). Although conventional approaches that are *strongly* recommended by the VA, including CBT, EMDR, CPT, and PET, have been shown to be effective, it has also been reported that they can provide limited efficacy for some veterans with PTSD, yielding high dropout rates and continued residual symptoms post treatment (Barr et al., 2019; Cushing & Braun, 2018; Holmes & Snape, 2019; Neukirch et al , 2018; VA, 2020; VA/DOD, 2017). One study found that the *strongly* recommended treatments have shown that 70% of subjects find no relief from PTSD symptoms or co-morbidities (Steenkamp et al., 2016). And one meta-analysis described a dropout rate from *strongly* recommended treatments to be 29% (Lee et al., 2016). Finally, as a result of the stigma that many veterans have regarding obtaining mental health treatment, Cushing and Braun (2018) found that 40% of veterans do not even seek help for PTSD symptoms. This can lead to self-treatment often in the form of substance use.

This SLR considered four research questions that examine cognitive and somatic mindfulness-based treatments and their ability to reduce stress-reactivity in veterans with PTSD. The treatments reviewed were mindfulness-based stress reduction (cognitive-based), meditation (cognitive-based), yoga (somatic-based), and martial arts (somatic-based). This chapter entails a detailed summary of the information assembled from the comprehensive SLR of 51 articles as described in Chapter Three. Conclusions are provided based upon the four research questions, which as previously presented, include the following:

Research Question One. How do mindfulness-based treatments, in general, reduce stress reactivity in veterans diagnosed with PTSD?

Research Question Two. What aspects of cognitive-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans?

Research Question Three. What aspects of somatic-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans?

Research Question Four. What recommendations are supported for implementing mindfulness-based practices into psychotherapy for veterans diagnosed with PTSD?

This study drew from PRISMA guidelines to control bias and collect and review data to complete the systematic literature review (see Figure 1). The SLR considered empirically based, peer reviewed articles pertaining to the four research questions. The SLR coalesced eight underlying themes that will be discussed in this chapter, including the following: reduce the effects of SNS and HPA; improve brain structure and functioning; foster an inner state of calmness; develop a present moment internal locus of control mindset; develop an interoceptive focus; embrace the warrior spirit through the benefits of movement; address stigma; and foster eudaimonic outcomes.

Participants

Participants included in this SLR were already included in research studies from peer-reviewed articles. As discussed in Chapter Three, the human subjects included in the studies comprising the SLR were all military age, meaning 18 and over, and contained both male and female participants. All searches focused only on English only articles, involving veterans diagnosed with PTSD. Veterans included were in Vietnam and subsequent conflicts until present. Reference lists of relevant articles were searched to identify potential additional studies of

relevance as discussed in Chapter Three. The articles provided in the reference section of this SLR were identified as the most relevant resources for this study. Participant inclusion was discussed in detail in Chapter Three.

Results Research Question One

The first research question was: How do mindfulness-based treatments, in general, reduce stress reactivity in veterans diagnosed with PTSD? This question sought to consider the underlying stress-related factors, leading to PTSD symptoms and co-morbidities as presented in the DSM-5 (APA, 2013). Two distinct themes underlying this question were identified in the research, including the following: (1) reduce the effects of SNS and HPA activation and (2) improve brain structure and functioning. Chapter Two identified the four categories of symptoms required for a veteran to be diagnosed with PTSD. These include intrusive memories, avoidance, negative cognitive affects, and hyperarousal. By reducing SNS and HPA activation, and changing brain functioning, research in this SLR showed that PTSD symptoms are significantly improved in veterans with PTSD.

Theme One – Reduce the Effects of SNS and HPA Activation

This theme summarizes the overall beneficial effects collectively provided by mindfulness-based treatments on veterans with PTSD. All research articles included evidence that the effects of stress reactivity can be mitigated by calming SNS and HPA excitation through varied means. The positive results of reducing stress reactivity were not dependent on whether treatments were cognitive or somatic. All treatments studied provided documented reductions in stress reactions, leading to improved PTSD symptoms and co-morbidities.

As described in Chapter Two, the PNS is the counteracting physiological component of ANS that down regulates SNS excitation. (Pasco, 2017). Stress inhibits the vagus nerve,

reducing its effectiveness in controlling SNS activation and inflammatory excitation (Bonaz, et al., 2018). The vagus nerve is centric as a functional component of the PNS. By releasing acetylcholine, a neurotransmitter, the vagus nerve mitigates the effects of the SNS, including the allostatic producing impacts of cytokines or pro-inflammatory molecules. This PNS returns the body to a homeostatic condition and results in the calming of stress reactivity. There are two common means that mindfulness practices were reported to engage the PNS, including interruption of cognitive stress and increased breath control.

First, interruption of cognitive stress was commonly reported by researchers. As an example, research by Johnson et al. (2015) reported that veterans who engage in mindfulness activities initiate PNS responses. As a result, they were able to reduce hyperarousal and avoidance, lowering stress overall. This is accomplished by the inherent ability of mindfulness to down regulate SNS and HPA excitation. In this study, results of decreased stress reactivity were reported to occur from training veterans to develop a present moment focus, including two core mindfulness principles of nonjudgmental awareness and acceptance. Authors reported that these principles demonstrated favorable results reducing PTSD symptoms.

In additional research by Fukuzawa and Inamasa (2020), mindfulness-based approaches were shown to produce increased self-awareness and positive internal locus of control. This enabled subjects to embrace a present moment focus free from patterned stressful ruminative thoughts. This led to more positive cognitive appraisal and emotional regulation. In turn stress reactivity through SNS and HPA activation decreased. Ultimately, veterans experiencing these benefits saw reductions in their PTSD symptoms.

The second means of engaging the PNS was through focus on the breath. Whether cognitive or somatic-based, mindfulness treatments focus on improving concentration on the

process of breathing. All research examined, whether cognitive or somatic, embodied training in breath control. When calm and slow, the breath itself stimulates the vagus nerve. As discussed in Chapter Two, this reduces stress reactivity in veterans with PTSD. Additionally, when veterans are taught to directly focus on the breath, they are indirectly distracted from traumatic memory rumination, leading to further calming effects (Greenberg, 2017; Seppala et al., 2014; Streeter et al., 2012).

Mindfulness breathing practices are a controllable process that effectively engage the PNS. This increases participants self-awareness, internal locus of control, and confidence in their abilities to self-regulate emotions and behaviors (Greenberg, 2017; Streeter et al., 2012). Additionally, by nature, mindful breathing restricts air flow, causing vagus nerve stimulation, thereby, reducing allostatic loads, as reported in research by Streeter et al. (2012). Furthermore, research consistently reported that mindful breathing calms subjects, allowing them to more proactively cognitively reappraise maladaptive thoughts, which can allow subject to develop greater focus on breath concentration, providing a continuous cycle of improvement in symptoms and co-morbidities (Greenberg et al., 2019; Greenberg, 2017; Harrison, 2017; Seppala et al., 2014; Streeter et al., 2012). Finally, breath control was shown to reduce cytokine presence through increased PNS and vagal nerve activation in research by Walsh et al. (2016) and Streeter et al. (2012). This led to reduced detrimental inflammation and long-term chronic effects of stress, including PTSD.

Theme Two – Improve Brain Structure and Functioning

Mindfulness practices overall were found to exhibit surprising physical changes to the brain and its functioning. Studies of brain images of veterans with PTSD have shown that chronic stress changes structure and reactivity of brain regions such as the hippocampus,

amygdala, prefrontal cortex, and the associated neural pathways. These are centric regions of the brain, housing emotional, memory, and logical functioning processes (Bremner et al., 2017; Streeter, 2012; Schwartz, 2018). For example, mindfulness practices were reported by Lukoff and Strozzi-Heckler (2017) as facilitating neurogenesis. Authors reported that this occurs by creating stronger connections among neural regions, reducing age-related brain atrophy, increasing blood/nutrient flow to brain regions, strengthening existing neural synapses, and releasing brain-derived neurotropic factor, further developing building nascent synapses.

In other research, the medial prefrontal cortex has been shown to present processing deficits, resulting from memories of traumatic events, leading to increased inflammation and decreased logical functioning (Campanella as cited by Bremner et al., 2017). Bremner et al. (2017) reported that brain changes in the PFC can occur with trauma and that the effects of the changes can be improved with mindfulness. Authors suggested that mindfulness can lead to improved brain functioning and deficits in the PFC. This was manifested by reduced fear activation and stress reactivity among veterans with PTSD.

As another example, Streeter et al. (2012) found that mindfulness practices physically increased hippocampus density. This increase in mass was suggested to account for corresponding decreased stress reactivity. Similarly, Schwartz et al. (2018) found that mindfulness practices lead to increased brain plasticity and neural pathway development, which was connected to reductions in PTSD symptoms. Finally, Kang et al. (2018) found that mindfulness practices showed marked improvements in electroencephalography (EEG) readings pre and post practice completion. Effects remained consistent over various periods of time in post-test studies.

Research analyzed in this SLR consistently found that mindfulness practices improve neurotransmitter regulation. Specifically, mindfulness practices were shown to increase and obtain optimal, homeostatic levels of neurotransmitters effective in reducing the effect of PTSD symptoms. These include serotonin, norepinephrine, endorphins, and dopamine. At normal concentrations, these are described as improving mood, reducing SNS activation, and increasing PNS activation (Greenberg, 2017; Sue et al., 2016). Additionally, GABA was consistently reported as being positively affected by mindfulness training. For example, Johnson et al. (2015) reported that mindfulness activities increase GABA presence. As reported in Chapter Two, increased GABA levels lessen PTSD symptoms and co-morbidities, namely depression and suicide, as it leads to an inhibitory effect on other neurotransmitters, reducing their overactivity, which mitigates hyperarousal (Streeter et al., 2012).

Results from these studies and others in this SLR are encouraging. First, these studies showed that even with the detrimental impacts of stress reactivity, including changes in brain anatomical and functional variances, the changes can be reversed in some cases. Second, by practicing mindfulness, veterans can learn adaptive responses to traumatic triggers, which combined with brain functioning changes can lead to the formation of new neural pathways. This can result in cognitive reframing of traumatic memories and memory storage and retrieval. This can break cycles of rumination and hyperarousal (Bremner et al., 2017; Streeter, 2012; Schwartz, 2018).

Discussion Research Question One

Two themes emerged in answer to the first research question: how do mindfulness-based treatments, in general, reduce stress reactivity in veterans diagnosed with PTSD? First, by engaging the PNS, all mindfulness-based practices included in this study effectively decreased

SNS and HPA activation. This was accomplished through interrupting cognitive stress and mindful breathing. Secondly, mindfulness-based practices have been shown to actually change brain structure and functioning, leading to increased positive cognitive adaptation. Thus, engaging the PNS and changing brain structure and function, led to reductions in PTSD symptoms for veterans.

Results Research Question Two

The second research question was: What aspects of cognitive-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans? This question sought to evaluate the literature to study the effectiveness of two cognitive-based practices: MBSR and meditation. Two related, but clearly distinct, themes underlying this question were identified among both of the cognitive-based treatments and explored further, including the following (1) foster an inner state of calmness, and (2) develop a present moment internal locus of control mindset. These two themes were also present in the somatic-based treatments but not to the same degree as with the cognitive-based treatments. This can be primarily attributed to the mental focus and attention being directed at coordination of the movements with somatic-based programs.

Theme One – Foster an Inner State of Calmness

Cognitive-based mindfulness practices were well supported through this SLR in increasing levels of calmness, both mentally and physically, through the mind-body connection (Harrison, 2017; Johnston et al., 2015; Staples, 2013). For example, support for increased inner calmness was reported in a study by West et al. (2017). These researchers found that cognitive aspects of mindfulness-based practices led to subjects learning to regulate emotions more efficiently, develop emotional safety and comfort, and cognitively re-appraise stressful

situations. This resulted in subjects reporting increased levels of their internal sense of calm and well-being. These improvements led to significant reductions in symptoms and co-morbidities experienced by veterans with PTSD.

Additional research by Lukoff and Stozzi-Heckler (2017), Schure et al. (2018), and Streeter et al. (2012) also illustrates this theme. These researchers focused on reducing hyperarousal and anxiety, which they indicated led to increased inner peace and calmness. Studies by these researchers focused on the physical brain effects discussed in research question one. They suggested that hyperarousal and anxiety in veterans with PTSD can be partly explained by the PFC failing to inhibit the activity of the amygdala. By engaging the cognitive aspects of mindfulness, amygdala hyperactivity can be negated, and the ANS can be returned to homeostasis, mitigating the detrimental effects of SNS and HPA excitation. This reduced the symptoms and co-morbidities commonly found in veterans with PTSD in the study.

Additional research targeted cognitive-based mindfulness improvements in sleep that reduced hyperarousal, leading to heightened inner calmness. Staples et al. (2013) suggested that sleep disturbances are particularly common in veterans with PTSD and are believed to underlie many physiological and psychological issues faced by veterans, further exacerbating hyperarousal. Researchers found that improvements in sleep duration and quality, resulting from cognitive-based treatments led to reductions in daytime hyperarousal. This produced increased self-awareness, mental clarity, and inner calmness, yielding reductions in PTSD symptoms.

Research involving meditation provided strong support for the calming effect of cognitive-based treatments, as highlighted by Kang et al. (2018) and Kearney et al. (2013). These researchers conducted their studies with an underlying belief that veterans with PTSD find it difficult to calm their minds as a result of marked hyperarousal and rumination. Often when

veterans try to practice mindfulness alone or in silence their thoughts return to their traumatic experiences and memories. Therefore, these researchers studied the effects of guided meditation, where subjects are led through the meditative process. This distracts the subjects from reflecting on traumatic memories and grounds them in the present moment. The researchers found that guided meditative techniques significantly reduced PTSD symptoms and co-morbidities and that veterans reported feeling calm and happy during the meditation and after it was over.

Research by Polusny et al. (2015), Stephenson et al. (2016), and Schure et al. (2018) reported consistent messages, suggesting that cognitive practices reduce PTSD symptoms through their inherent calming effect. These researchers noted that cognitive practices focus on the following beneficial concepts: accepting thoughts, feelings, and experiences with a present moment, non-judgmental approach; improving negative mood states, which yield emotional instability; and reducing rumination and anxiety, which exacerbate hyperarousal. Researchers suggested that when veterans embrace these concepts through cognitive-based practices they report improved feelings of calmness and subsequent reduced PTSD symptoms.

Theme Two – Develop a Present Moment Internal Locus of Control Mindset

All cognitive-based mindfulness research included in the SLR showed favorable results in enhanced self-awareness and present moment emphasis. Research protocols embraced a collective suggestion that by focusing on the present, and taking control of that which is controllable, an improved mindset could follow. Authors concluded that this improved mindset effectively reduces symptoms and co-morbidities of PTSD in veterans (Baum, 2010; Bremner et al., 2017; Crum, 2017; Greenberg, 2020; Smith et al., 2020; Tomlinson et al., 2018).

Present moment and internal locus of control were combined and not treated as separate themes intentionally. It is important for veterans with PTSD to develop an internal locus of

control. It is equally important for that locus of control to remain in the present moment, free from historical rumination that increases hyperarousal. In other words, an internal locus of control can be developed but it can remain in the past within the context of the trauma incurred – the veteran takes control but spends all time taking control of his/her role in the previous traumatic event. This is still maladaptive, continuing the resulting PTSD symptomology. As has been discussed, it is necessary for veterans to take control of their present moment thoughts *and* free themselves of traumatic rumination.

The focus on mindfulness practices in general, and specifically the cognitive aspects, are suggested by authors as being favorable for veterans with PTSD who are unresponsive to strongly recommended treatments, which as described in Chapter Two is the majority. These practices are well-suited to engage veterans by helping them to develop underlying mindfulness concepts that teach them to abandon repetitive ruminating mindsets that focus on traumatic event(s). For example, Baum (2010) suggested that veterans who can learn to take control of their unique thought processes and change their maladaptive patterned rumination to stress, can make more effective choices. In other words, Baum proposed that when veterans learn to maintain a present moment focus, they have the ability to take internal control of their responses, leading to reductions in PTSD symptoms.

Additional research by Schure et al. (2018), demonstrated decreased rumination and anxiety in veterans who were taught to maintain a present moment focus. In this research, veterans were instructed to develop a mindset of curiosity, free from judgement - and to focus on the traumatic events in a pre-determined intentional manner (they choose when to think about the trauma, which increased their internal sense of control). Schure and colleagues suggested that this mindset teaches veterans to acknowledge the historical events with planned focus but not to

ruminate on them uncontrollably. Subjects learned to deal with painful traumas more proactively and with control; abandoning the repetitive patterns of detrimental rumination. Finally, the veterans in this study reported that they were able to catch themselves in the process of rumination, which helped them to mitigate hyperarousal, and again, reinforced their ability to take control.

Research by Bremner et al. (2017) supported the importance of a present moment internally control driven mindset as well. Their research focused on using cognitive-based mindfulness to reduce reactivity and avoidance in veterans with PTSD. By increasing veteran's mental control abilities, reactivity to traumatic memories decreased. Ultimately, researchers found that this led to improved emotional control and reduced PTSD symptomology. The authors also found that cognitive rumination decreased as well, furthering the positive impact on PTSD symptoms. Supporting Bremner's focus on rumination, research by MacLean et al. (2010) suggested that cognitive mindfulness practices teach subjects to reduce mind wandering, which in veterans, frequently means ruminating on previous traumas. MacLean found that subjects who practiced cognitive mindfulness increased their ability to selectively focus attention on a chosen stimulus, which enabled them to control their rumination through improved voluntary attention.

Specific to mindset, in-and-of-itself, research in this SLR found favorable reductions in PTSD symptoms for subjects who to took control and developed a positive mindset (Crum et al., 2017; Greenberg, 2019; Smith et al., 2020). From this SLR's context, a mindset comprises the core assumptions about events and the causes of stress in the environment. This mindset orients the person to a particular schema, including expectations, attributions, and goals (Crum et al., 2017; Greenberg, 2020; Smith et al., 2020). Authors found that a positive mindset led to lower reported stress levels and PTSD symptoms. Additionally, authors suggested that by learning

cognitive-based mindfulness practices veterans with PTSD develop a mindset driven by a controlled present moment focus, free from rumination and judgement normally directed at previous traumas. Ultimately, this mindset, and the resulting present moment focus, led veterans to re-frame their schemas in more positive, adaptive ways, further reducing PTSD symptoms through homeostatic return of the SNS and HPA axis.

Finally, researchers supported the significance of cognitive-based mindfulness treatments and their ability to reduce the future development of PTSD during the latent period (APA, 2017; Badiuk et al., 2016; Barr et al., 2019; Gindi et al., 2016; Cramer et al., 2018; Hourandi et al., 2016; Neukirch et al., 2018; Omidi et al., 2013; Russell & Figley, 2017; Stephenson et al., 2016). As discussed in Chapter Two, the latent period is the time between the occurrence of the traumatic event and the onset of PTSD symptoms in veterans. Authors proposed that this potential long-term benefit results from the inherent principles of mindfulness of focusing on the present moment, developing self-control, and cognitively re-appraising how the traumatic events are viewed, interpreted, and stored in memory. Engaging a mindfulness approach at this critical latent period can reduce the related stress reactivity of the trauma, mitigating the associated detrimental long-term psychological and physiological effects. This can effectively reduce the future formation, or at least severity, of PTSD and related co-morbidities

Discussion Research Question Two

While all studies demonstrated favorable results for the cognitive-based mindfulness practices in reducing symptoms and co-morbidities in veteran populations diagnosed with PTSD, two closely related, yet exclusive, themes emerged in regards to answering the second research question: What aspects of cognitive-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans? First, cognitive-based mindfulness practices foster an inner state

of calm, which is particularly effective in reducing rumination and hyperarousal. Second, these practices show efficacy in developing a mindset focused on the present moment with an internal locus of control. Interestingly, this was shown to be effective in retroactively handling PTSD symptoms, as well as proactively, if engaged during the latent period.

Results Research Question Three

The third research question was: What aspects of somatic-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans? This question sought to evaluate the literature to study the effectiveness of two somatic-based practices: yoga and martial arts. It was interesting to note that it did not matter what form of yoga or what form or martial art was practiced in the studies, as all included in the research were reported as effective at providing relief for veterans with PTSD. Two themes underlying this question were identified and explored further, including the following (1) develop an interoceptive focus, and (2) embrace the warrior spirit through the benefits of movement. These two themes were specifically attributed to somatic-based mindfulness and not present, or to the same degree, with cognitive-based approaches.

Theme One – Develop an Interoceptive Focus

Considerable research in the SLR supported the concept that increased interoception is developed through somatic-based practices, which provides great benefits to veterans with PTSD. As an example, Neukrich et al. (2018) conducted research on interoceptive qualities provided through somatic approaches. The researchers used yoga as their somatic practice studied and found that subjects who practiced yoga significantly increased their interoceptive functioning. Authors suggested that this improved participants' ability to process PTSD symptoms more adaptively. As a result, subjects reported significant decreases in PTSD

symptoms and co-morbidities, including depression, anxiety, and stress. The heightened awareness provided by interoceptive functioning lead to better emotional self-regulation through identification of somatic sensations. Additionally, subjects demonstrated greater abilities to focus on the present moment. Authors concluded that these favorable aspects of interoception enabled subjects to be better equipped to embrace PTSD symptoms without becoming hyperaroused by resulting SNS activation.

Additional research highlighted the concept that somatic practices embrace interoceptive effects that can be transferred to other unrelated situations (Cramer et al., 2018; Greenberg et al., 2019; Leong et al., 2011; McCarthy et al., 2017; Mehling et al., 2017; Neukirch et al., 2018; Rios et al, 2017). In other words, by incorporating a somatic practice, including yoga or martial arts, the focus necessary to learn the movements requires the subject to mindfully concentrate on the specific movement itself. It is not possible for the mind to ruminate on a traumatic event if a yoga pose requires concentration to balance and not fall. According to these authors, a correlation can be established to focus on any task at hand, free from rumination, avoidance, or distraction. The exercise is not as important as the interoceptive learning – it is the development of interoception that can be transferred to any other activity.

The reason interoception occurs was best reported in an SLR by Rios et al. (2017). Their SLR found that somatic practices require dynamic, plyometric, and static physical activity, including balance, movement coordination, musculoskeletal development, flexibility, and cardiovascular fitness. Additionally, these movements require mental focus and concentration. The mind and body must be in sync to coordinate mental and physical requirements and balance sensory and motor stimuli, which require the development of interoceptive awareness (Leong et al., 2011; Rios et al, 2017).

Self-awareness, focused attention (learning a somatic movement), and internal locus of control underlies somatic-based treatments' ability to stimulate interoceptive self-regulation. This leads to a heightened internal locus of control. This in turn, promotes self-regulation through mind and body awareness, as suggested in research by Greenberg (2019) and Schwartz (2018). This mind-body, or psychosomatic interoceptive connection, is advantageous for veterans to understand in order to recognize somatic maladaptive affects and mitigate them more effectively at the onset instead of allowing rumination to lead in increased hyperarousal (Schwartz, 2018).

Theme Two – Embrace the Warrior Spirit Through the Benefits of Movement

Somatic based treatments have been suggested to a good alternative, or compliment, to strongly recommended conventional treatments for veterans with PTSD (Barr et al., 2019; Hamilton, Coleman, & Davis, 2016; Heath et al., 2017; Niles et al., 2016; Paige et al., 2018; Pearson et al., 2020). Niles et al. (2016) referred to these treatment as embracing the *warrior spirit*, as they support the combat mindsets that many veterans with PTSD retain. Additionally, many veterans are more comfortable with physical activity as it supports their military training and lifestyle (Lukoff & Stozzi-Heckler, 2017). Incorporating the concept of the warrior spirit has been suggested to be an important factor in reducing stigma that veterans have with conventional treatments as reported in numerous research efforts (Barr et al., 2019; Hamilton, Coleman, & Davis, 2016; Heath et al., 2017; Niles et al., 2016; Paige et al., 2018; Pearson et al., 2020).

As discussed, trauma and traumatic memories initiate the stress reactivity process. This can result in somatic-based bodily pain caused by cytokine inflammatory processes (Schwartz, 2018; Streeter et al., 2012). Somatic practices focus on the united mind and body. This is accomplished by coordinating kinesthetic movement with present moment focus and breath

control. This causes the PNS to engage, decreasing SNS and HPA activation. In other words, the mind-body focus reduces stress reactivity (Streeter et al., 2012). Many veterans with PTSD report somatically stored tension and discomfort, which several authors suggested results from the detrimental effects of stress reactivity that have not been released due to the continued rumination and hyperarousal related to the original trauma (Harrison, 2017; Markowitz et al., 2015; Niles et al., 2016; Raman et al., 2013). The reduction of stress reactivity through the somatic practices of focusing on breath and movement releases stored inflammation. For example, research by Johnston et al. (2015) suggested that somatic breathing exercises modify respiratory processes, contributing to reduced SNS hyperstimulation.

Researchers identified in this SLR found numerous additional benefits of somatic practices. First, they can provide problem-solving opportunities for the practitioner due to the resilience and internal locus of control that they instill, which is transferred to life out of the training itself (Willing et al., 2019). Second, practices, particularly martial arts, provide an enhanced exposure therapy-like experience, contributing to significant reduction in PTSD symptoms among veterans (Willing et al., 2019). Third, they focus on a present moment mindset and interoceptive awareness of musculoskeletal movement and sensations (Niles et al., 2016). The controlled, smooth movement with simultaneous mindful focus on breathing is reported to deepen relaxation and enhance regulation of hyperarousal (Markowitz et al., 2015; Raman et al., 2013). Fourth, these practices have been shown to increase lung capacity, flexibility, emotional sensitivity, balance, and quality of sleep (Markowitz et al., 2015; Solloway et al., 2016; Wang et al., 2014; Webster et al., 2016). Fifth, somatic practices have been found to decrease symptoms of depression, pain, anxiety, fear, hyperarousal, and hostility, and also to enhance emotional

regulation, memory, and cognitive processing (Mazzucchelli et al., 2010; Raman et al., 2013; Solloway et al., 2016; Wang et al., 2014; Webster et al., 2016).

Pasco et al. (2017) published an SLR, evaluating the effectiveness of somatic treatments. The SLR included 42 studies and focused on yoga. Results of the SLR provided confirmatory evidence that somatic practices, in this case yoga, were effective at reducing the detrimental effects of longitudinal chronic stress found in veterans with PTSD. Specifically, Pasco and colleagues described a broad range of physical benefits provided by somatic-based practice noted in their SLR. These included improved blood pressure, lower hormonal output, improved heart rate, stabilized heart rate variability, improved glucose levels, and improved cholesterol profiles.

Discussion Research Question Three

While all studies that met criteria for this SLR suggested favorable results for the somatic-based mindfulness practices, two themes emerged in answering the research question: What aspects of somatic-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans? First, interoception was suggested to teach veterans how to focus and concentrate effectively, which increased self-awareness, offered a relief from rumination, and provided the veteran with skills to carry interoceptive benefits to other situations. Second, movement engages the warrior spirit, which in addition to physical health improvements, was found to be beneficial in addressing stigma related issues to obtaining treatment for PTSD symptoms.

Results Research Question Four

The fourth research question was: What recommendations are supported for implementing mindfulness-based practices into psychotherapy for veterans diagnosed with PTSD? This question sought to assess research findings about mindfulness-based practices,

whether cognitive, somatic, or both, that show efficacy for a practicing psychotherapist to understand and incorporate in treatment plans for veterans with PTSD. Two themes underlying this question were identified and explored further, including the following (1) address stigma, and (2) foster eudaimonic outcomes. The second theme is particularly interesting and relevant, as it is the underlying concept from the theoretical framework of mindfulness-to-meaningfulness theory selected to guide this doctoral project, as discussed in Chapters One and Three.

Theme One – Address Stigma

As a result of substantial stigma harbored by veterans with PTSD (discussed in Chapter Two), conventional approaches are frequently negatively perceived, as reported by multiple research efforts (Barr et al., 2019; Fogger et al., 2016; Hamilton et al., 2016; Heath et al., 2017; Paige et al., 2019; Pearson et al., 2020; Steenkamp et al., 2016). These researchers suggested that most resistance to conventional treatments results from the difficulty veterans have about admitting that help is needed and asking for assistance. Authors suggest that this goes against military culture of being strong and showing no weakness. In war, if a combat military person shows weakness, it can lead to shame from colleagues or even death in combat. Additionally, researchers highlighted the commonality that many veterans share regarding avoidance of dealing with their traumas, which they indicated contributes to the high treatment dropout rates previously discussed.

Conventional treatments often focus directly on the trauma by working with the veteran to address the memories in the open with a therapist. However, this neglects the important concept of avoidance, which authors suggested leads to higher dropout rates in veterans. In other words, by encouraging veterans to confront their trauma directly, as with PET for example, the resulting hyperarousal can be so intense that the veteran drops out of treatment. Research by

Schnyder et al. (2015) and Feduccia et al. (2019) suggested that the more direct focus in strongly recommended treatments can be counterproductive and actually increase SNS and HPA activation, causing continued, or worsened, PTSD symptoms, particularly with avoidance, rumination, depression, and hyperarousal. As a result, the researchers noted that the veteran then endures the symptoms of PTSD with no assistance or pursues a path of self-treatment or medicating through substances, further exacerbating the situation.

For treatments with veterans with PTSD to be successful, researchers consistently stated that psychotherapists must consider the underlying stigma that may be present. Researchers in this SLR repeatedly claimed that mindfulness-based approaches, cognitive or somatic, embrace fundamentally different theoretical and practical frameworks than the strongly recommended conventional approaches. They went on to state that mindfulness approaches can be incorporated in treatment protocols to effectively address the symptoms and co-morbidities of PTSD while being sensitive to stigma related issues. Researchers suggested that the hyperarousal produced through direct confrontation of the traumatic memories can be avoided with mindfulness-based practices, but the trauma can still be indirectly addressed, and PTSD symptoms reduced, as discussed in the previous themes.

An additional benefit of mindfulness practices that researchers reported as being effective for reducing therapeutic stigma involves group-based settings. Many mindfulness-based practices embody a group approach. This can be quite beneficial for veterans, as it adds social support and understanding, reducing some isolation that veterans may feel (Barr et al., 2019; Heath et al., 2017; Polusny et al., 2015; VA/DOD, 2017). Researchers have reported that group-based mindfulness activities can be favorably received among veterans with PTSD (Barr et al., 2019; Hamilton, Coleman, & Davis, 2016; Heath et al., 2017; Niles et al., 2016; Paige et al.,

2018; Pearson et al., 2020). Research noted that this occurs due to the shared experiences that members harbor and the reduced stigma as veterans see that they are not alone. In other words, they have the similar experiences to other groups members and feel a warrior spirit bonding with them that cannot occur with non-veterans. This helps veterans to resolve the limiting feelings of weakness and shame ingrained in their military culture.

Theme Two – Foster Eudaimonic Outcomes

The theoretical focus on this SLR is based on MTMT as described in Chapter Three. MTMT is centered on eudiamonic outcomes. Garland et al. (2015a) described eudaimonic outcomes as resulting from a mindful transcendence from traumatic rumination to a life of purpose and meaning. What is most interesting is that in the course of conducting this SLR, it became clear that the concepts behind MTMT provide a common theme, which supports the recommendations for practicing psychotherapists in treating veterans with PTSD. This finding was not expected. Essentially, research in this SLR overwhelmingly supported the underlying MTMT concept that treatment for veterans with PTSD must not stem from a maladaptive focus. In other words, it can't just focus on what is wrong – the PTSD symptoms and traumatic events. Rather, is must focus on the positive - life meaning, purpose, cognitive re-appraisal, self-awareness, and internal locus of control to provide the most effective benefits (Barr et al., 2019; Cramer et al., 2018; Feduccia et al., 2019; Hamilton et al., 2016; Heath et al., 2017; Neukirch et al., 2018; Paige et al., 2018; Pearson et al., 2020; Polusny et al., 2018; Schnyder et al., 2015; Schure et al., 2018; Staples et al., 2013). In other words, treatment is most successful with a eudiamonic approach. Essentially, the premises underlying MTMT are supported by the previous five themes of this SLR.

Regarding veterans with PTSD, the MTMT framework focuses on helping participants to reframe negative trauma to positive life changing efforts. This is accomplished in part through cognitive reappraisal. Garland et al. (2015a) suggested that this type of reframing enabled veterans to reduce rumination, develop an internal locus of control, and focus on the present moment, again tying in with the other themes of this SLR. For example, as previously discussed, Fukuzawa and Inanmasa (2020) conducted research on cognitive reappraisal through mindfulness training. They found that mindfulness-based approaches led to improved self-concept. This led subjects to reporting more positive life outlooks.

Garland et al. (2015b) suggested stated that even when mindfulness practices are included in conventional therapeutic approaches, they become centered on mitigating maladaptive patterns. Although, resolving maladaptive constructs can be valuable, Garland posited that it is not beneficial to neglect fostering adaptive patterns. As discussed in previous themes, the focus on the present and an internal locus of control can lead to a mindset that becomes free from the limiting traumatic events, which reduces PTSD symptoms. Additionally, as previously highlighted, most veterans with PTSD exhibit high levels of hyperarousal. Through the principles of MTMT, Garland et al. (2015a; 2015b) have found in their research that veterans would benefit from an eudiamonic approach - or transcending their traumas and focusing in the present moment in a positive manner. Garland et al. summarized their research by suggesting that enabling veterans with PTSD to incorporate mindfulness-based treatments provides them with concepts they need to release stress inducing rumination, foster positive outlook through cognitive reappraisal, and derive greater symbiosis with strongly recommended conventional treatments, all of which reduce PTSD symptoms.

Discussion Research Question Four

Two themes emerged in answering the fourth research question: What recommendations are supported for implementing mindfulness-based practices into psychotherapy for veterans diagnosed with PTSD? First, mindfulness practices overall were found to be effective in lowering stigma that many veterans have regarding mental health treatment. Second, using mindfulness practices as an approach to focus veterans away from negativity and rumination and toward positive life meaning were suggested to be favorable for therapists to embrace. These two themes were considered by many authors to address the crux of the problem for veteran dropout rates and to be central for practicing psychotherapists to understand.

Summary

This chapter summarized the literature that was reviewed for the purpose of addressing the four research questions posed. An SLR was chosen to select and evaluate relevant research per PRISMA guidelines, which resulted in eight underlying themes generated from the 51 research articles included in the analysis (see Table 1).

Table 1

Research Questions and Themes

Research Question 1	**How do mindfulness-based treatments, in general, reduce stress reactivity in veterans diagnosed with PTSD?**
Theme One	Reduce the effects of SNS and HPA activation
Theme Two	Improve brain structure and functioning
Research Question 2	**What aspects of cognitive-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans?**
Theme Three	Foster an inner state of calmness

Theme Four	Develop a present moment internal locus of control mindset
Research Question 3	**What aspects of somatic-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans?**
Theme Five	Develop an interoceptive focus
Theme Six	Embrace the warrior spirit through the benefits of movement
Research Question 4	**What recommendations are supported for implementing mindfulness-based practices into psychotherapy for veterans diagnosed with PTSD?**
Theme Seven	Address stigma
Theme Eight	Foster eudaimonic outcomes

Research supporting these themes provided considerable documented results for the efficacy of mindfulness-based practices in treating veterans with PTSD. The final goal of the SLR is to finalize conclusions from the study to inform practicing psychotherapists as how to best utilize mindfulness-based practices when treating veterans with PTSD. Turning to Chapter Five, the clinical and theoretical implications of the SLR are provided.

CHAPTER FIVE

DISCUSSION

The process of treating PTSD in veterans is complex for practicing psychotherapists, particularly for therapists who have not experienced combat themselves and find it difficult to relate to veterans' stigma toward treatment. As previously discussed, conventional treatments for veterans with PTSD have been identified and *strongly* recommended by the VA, which include CBT, EMDR, CPT, and PET (VA, 2020; VA/DOD, 2017). However, the majority of veterans undergoing these treatments do not complete them or find little or no relief from their symptoms in large part due to stigma toward therapy (Barr et al., 2019; Cushing & Braun, 2018; Holmes & Snape, 2019; Neukirch et al., 2018). As a result, the purpose of this doctoral project was to conduct a qualitative systematic literature review, evaluating mindfulness-based treatments that are suggested to show positive outcomes in reducing PTSD and common co-morbidities, including suicide, in veteran populations. Specifically, research in this project focused on two categories of mindfulness-based treatments: (1) cognitive based, including MBSR and meditation, and (2) somatic based, including yoga and martial arts. The four specific research questions that were addressed are as follows:

Research Question One. How do mindfulness-based treatments, in general, reduce stress reactivity in veterans diagnosed with PTSD?

Research Question Two. What aspects of cognitive-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans?

Research Question Three. What aspects of somatic-based mindfulness treatments are effective in reducing symptoms of PTSD in veterans?

Research Question Four. What recommendations are supported for implementing mindfulness-based practices into psychotherapy for veterans diagnosed with PTSD?

The theoretical framework underlying this doctoral project was MTMT, which was discussed in Chapters One and Two. MTMT advocates for cognitive re-appraisal through greater self-awareness and interoception. This can lead to reduced rumination, improved internal locus of control, and better focusing on the present moment, leading to a eudiamonic positive life focus (Garland et al., 2015a; Garland et al., 2015b). Through the research in this doctoral project, these concepts were found to be quite favorable not only for the theoretical framework, but more importantly, for psychotherapists to use centrically in protocols with veterans with PTSD. The implications of MTMT for practitioners will be highlighted later in this chapter.

PRISMA guidelines were used to provide structure for the data selection process and to control for researcher bias. The project reviewed 321 research articles and narrowed the search to 51 articles that comprise the SLR (see Figure 1). During the data collection and review process, the four research questions were studied, and eight themes emerged, which were discussed in Chapter Two (see Table 1). The theoretical implications of the study are discussed next. Specifically, the findings, implications for professional practice, and recommendations for future research will now be covered.

Findings

Research from this doctoral project provided consistent support for the benefits of mindfulness-based practices when used with veterans diagnosed with PTSD. These practices were shown to be particularly favorable in helping veterans to overcome stigma toward treatment, subsequently improving dropout rates and symptoms of PTSD. As noted, eight themes emerged. In brief, the key underlying finding from these eight themes is that they all lead to

psychophysiological moderation of SNS and HPA activation, which provided relief from PTSD symptoms and co-morbidities. These findings will now be discussed.

Research was consistent in reporting that chronic SNS activation of the stress response system produces detrimental allostatic loads. This decrease in homeostatic regulation leads to chronic psychological health conditions. Chronic stress dysregulates brain functioning, processing of memories, neural activation, cytokine presence, and neural pathways, leading to psychological disorders. These include depression, dementia, post-traumatic stress disorder, and related co-morbidities (Rodriguez et al., 2018; Straub & Cutolo, 2017). Additionally, HPA axis dysregulation is positively associated with psychosomatic and psychological disorders (Streeter et al., 2012; Verma et al., 2011). Hyperactive HPA hormonal secretions have been found to underlie major depressive disorder, social phobia, panic disorder, generalized anxiety disorder, obsessive–compulsive disorder, hyperactivity, and fear responses (Streeter et al., 2012; Verma et al., 2011). These are all common symptoms and co-morbid factors in PTSD. Finally, hypercortisolism has been consistently reported as a commonality among many psychological disorders. Research evaluated in this project was supportive is suggesting that mindfulness-based treatments show high efficacy in mitigating stress reactivity considerations in SNS and HPA activation through reducing hormonal hyperactivity, including cortisol, and activating the PNS. This provides solid evidence that these practices are well-suited for veterans with PTSD. The beneficial outcomes provided by mindfulness were not exclusive to either cognitive or somatic-based treatments. In other words, both categories provided positive relief from PTSD symptoms and co-morbidities in veteran subjects.

As discussed in Chapter Two, the prime factor in moderating the activation of the SNS and HPA pathways is stimulation of the PNS initially through the vagus nerve. The vagus nerve

releases acetylcholine, which through various chemical pathways returns the body to homeostasis. Reducing the stress reactive allostatic loads mitigates the negative long-term effects of pro-inflammatory cytokines. The processes initiated by the vagus nerve return the hyper-aroused stress reactive state to baseline SNS and HPA functioning. Mindfulness-based practices all involve a concerted focus on slow, clam breathing patterns. As discussed in Chapter Two and Four, these patterns have been shown effective in engaging the vagus nerve, thereby, directly calming the stress reactive processes (Seppala et al., 2014)

Additionally, by improving the actual functioning of the brain and neurological systems, stress reactivity can be reduced. As discussed in Chapter Two, the PFC lags behind the amygdala. This results in a person who is behaving through emotional control and not logically oriented thinking. This hyper-aroused emotional state further contributes to an allostatic condition, resulting in heighted PTSD symptoms in veterans. Research included in this review showed that mindfulness positively impacts brain functioning, leading to improved PFC functioning and reduced amygdala hypersensitivity. Mindfulness practices were shown to improve hippocampal activity, PFC functioning, neural pathway connectivity, neurological blood flow, neurotransmitter presence, inflammatory processes, and neurogenesis. These improvements in-turn fostered positive changes in memory recall, fear factor, hyperarousal, cognitive re-appraisal, and rumination, leading to decreased SNS and HPA influence (Bremner et al., 2017; Kang et al., 2018; Lukoff & Stozzi-Hekler, 2017; Streeter, 2012; Schwartz, 2018).

Research evaluated in this project provided evidence that mindfulness-based practices can show positive results in increasing cognitive and somatic calmness. Calmness is inversely related to hyperarousal. By increasing calmness, hyperarousal decreases, which counters the stress reactive processes engaged by the SNS and HPA axis (Lukoff & Stozzi-Heckler, 2017;

Schure et al. 2018; Streeter et al., 2012). Most mindfulness practices specifically focus directly on reducing hyper-aroused, ruminative states. Authors collectively stated that hyperarousal is often caused, in part, by the inhibitory process of stress reactivity on the PFC (Arnsten et al., 2015; Garfinkel & Critchley, 2015; Wheelock et al., 2018). This results in the PFC failing to have an inhibitory effect on the amygdala. This leads to unchecked hyperarousal and emotional dysregulation. Drawing from the cognitive focus in mindfulness practices, the PFC can be re-engaged, and the amygdala can return to homeostatic regulation. This results in a return to baseline SNS and HPA homeostasis.

The mindfulness-based practices included in this doctoral project demonstrated favorable results in helping veterans with PTSD to change their mindsets. This involved teaching subjects to take control of their thinking patterns by focusing on the present moment. This greatly reduced the dissociative feelings and chronic rumination typical in veterans with PTSD, which both lead to increases in SNS and HPA activation. This mindset combined with the development of an interoceptive focus provided substantial relief from stress reactivity and PTSD symptoms in veterans in the studies considered. The key outcome of this mindset was that it enabled veterans to take control of their rumination (Schure, 2018). Instead of allowing the rumination to consume them, they learned to keep their mind in the present by engaging mindfulness principles. Then in a controlled, intentional setting, the veteran could address traumatic memories in the present moment in a favorable and safe atmosphere. This internal control and proactive management of traumatic memories with a present moment focus led to reduced hyperarousal and SNS and HPA activation.

Finally, the originating trauma itself and resulting traumatic perceived memories maintain the active, chronic engagement of the SNS and HPA axis. This continual activation is a

central causal factor in provoking detrimental physiological and psychological effects of stress reactivity, as discussed in Chapter Two. When stress reactivity is not released, psychosomatic emotional and bodily pain results, much of which is derived from allostatic hormonal presences and cytokine inflammatory processes (Schwartz, 2018; Streeter et al., 2012). By blending kinetic activity with breath control and a present moment, internal locus of control mindset, mindfulness practices initiate PNS activity, leading to diminished SNS and HPA influence. Veterans with PTSD commonly describe somatically stored tension and discomfort, such as migraine headaches, chest pain, back pain, fibromyalgia, fatigue, and sexual dysfunction, in addition to the PTSD symptoms and co-morbidities. Numbers of veterans with PTSD encountering these issues range from 24 to 50% (Strainge et al., 2019; Edgcomb et al., 2016). Authors in this project attributed these conditions to the body and mind's inability to release the detrimental effects of SNS and HPA activation from chronic rumination and hyperarousal (Harrison, 2017; Markowitz et al., 2015; Niles et al., 2016; Raman et al., 2013). The reduction of stress reactivity through the somatic practices of focusing on breath and movement releases stored inflammation and down regulates HPA hormonal imbalances, providing relief from psychosomatic issues.

Implications for Professional Practice

The benefits of mindfulness practices for psychotherapeutic settings were favorably supported in the research reviewed in this doctoral project. The research provided insight into effective means for therapists to consider that have been shown to help veterans overcome stigma and shame, which makes if more likely that veterans will engage in a positive therapeutic process. This research is threefold in recommendations for practitioners. First, acknowledging and addressing stigma and shame itself. It was consistently reported in research that stigma and shame must be prime considerations for clinicians in order to reduce the dropout rates and lack

of treatment relief encountered by veterans with PTSD. Second, fostering eudiamonic outcomes proved to be a valuable approach to helping veterans to abandon perpetual, chronic, negative rumination and develop a meaningfully positive life focus. Third, including mindfulness-based practices in isolation or with strongly recommended practices. As reported in Chapter Four, mindfulness-based practices have been shown effective in improving symptoms and co-morbidities in veterans with PTSD by reducing SNS and HPA activation and are well-suited to be included in therapy. These three recommendations will now be discussed from the context of providing guidance to professional practitioners in treating veterans with PTSD.

Address Stigma and Shame

As reported throughout this project, the majority of veterans with PTSD either drop out of treatment or report finding little relief from symptoms (Cushing & Braun, 2018; Mitt et al., 2014; Steenkamp, 2016; Watts et al., 2014). It is important for clinicians to understand the wide scale resistance to treatment that combat veterans may exhibit, which contributes to the development of PTSD. Most resistance results from continued stigma and shame about admitting that help is needed and subsequently asking for assistance. (Barr et al., 2019; Hamilton et al., 2016; Heath et al., 2017). Although stigma applies throughout the military, combat intensive forces face a higher likelihood of encountering stress reactivity on a frequent and recurring basis.

There are five predominant underlying factors that result in feelings of stigma or shame in veterans with PTSD toward obtaining mental health services (Barr et al., 2019; Hamilton et al., 2016; Heath et al., 2017; Naval Commanding Officer, Naval Special Warfare, confidential personal communication, May 2020). First, deployed military personnel face extremely dangerous situations on a daily basis, and as a result, they are never supposed to demonstrate weakness in any form – physical, or most importantly, mental. This ideology is initiated at the

beginning of the training programs and continues throughout their careers, and most interestingly, beyond. It is grounded in the concept that anything other than embodying strength and persisting through difficulties can lead to mission failure and death to oneself or teammates. As a result, seeking mental health treatment is perceived to be a weakness to some veterans, leading to stigma, shame, and avoidance. Second, if military personnel seek treatment for a mental health issue, regardless of what the context is, they are often removed from active duty status. This is one of the worst things that can occur to military staff and further exacerbates the mental health issues and isolation. This stigma, occurring during active duty, often continues into veteran status. Third, losing the confidence and trust of one's teammates is never acceptable and is considered a major risk for placing the entire team at risk. Seeking mental health can lead to rejection and isolation from teammates, which can be traumatic in-and-of-itself. Again, many veterans continue to harbor these feelings, which contribute to stigma and shame against treatment. Fourth, the isolation faced by military staff, particularly combat or special forces staff, can make it exceptionally difficult to be able to discuss what they have done and seen. Family and friends often do not know anything about the missions conducted or actions that had to be taken. It is not uncommon for close family members to not even know what units their loved ones are actually in. The isolation due to the classified nature of their work can make it impossible for these combat units to discuss their issues with anyone outside of their teams. Again, this produces feelings in veterans that it is wrong to discuss situations that occurred during active duty, further contributing to their perceived stigma and shame when considering mental health services. Finally, underlying the first four stigmas, there is a Navy SEAL saying referred to as "embrace the suck," which is embraced as a statement of honor. This saying means that no matter how bad a situation is the culture dictates that one must always focus exclusively

on the mission and place everything else aside, including pain and discomfort. In effect, SEALs, and other combat forces, are trained to compartmentalize the stress that they experience, which makes veterans feel shame at discussing issues.

These five underlying factors that result in feelings of stigma or shame lead to a worsening of the situation, either by preventing the person from seeking treatment - or if treatment is sought, by augmenting further shame and guilt. Again, this mindset continues well after the latent period and after discharge with veteran status. By understanding these factors and addressing them openly, studies show that substantial benefit can be derived from treatment for PTSD pre and post discharge (Barr et al., 2019; Hamilton et al., 2016; Heath et al., 2017). As discussed in this doctoral project, mindfulness has been shown effective in dealing with military based stigma and in reducing symptoms and co-morbidities of PTSD in veterans who are strongly grounded by shame and feelings of weakness.

Additional considerations pertaining to stigma and shame are important. In addition to the high dropout rates and limited effectiveness of strongly recommended treatments for veterans, it has been suggested that PTSD is underreported (Barr et al., 2019; Fogger et al., 2016; Hamilton et al., 2016; Heath et al., 2017; Paige et al., 2019; Pearson et al., 2020). This is due to several underlying factors. First, many veterans will not readily admit to having problems to anyone due to their internal feelings of shame and belief that mental health issues are a weakness. Second, denial or suppression of symptoms in veterans has been reported as high, leading to avoidance and suppression. Third, self-management, often through substance use, many superficially numb the issues – or more sadly, the veteran may commit suicide without ever receiving help.

Foster Eudiamonic Outcomes

As described my authors in this study, veterans are reported to be caught in a negative cycle of rumination and hyperarousal. As a result, they can develop negative mindsets, which further the cycle of stress reactivity. Eudiamonic approaches, advocated by MTMT, embrace a positive mindset and outlook, guiding the veteran to transcend the originating trauma and recalled memories of it. This approach has been reported as a beneficial framework for veterans with PTSD (Garland et al., 2015a; Garland et al., 2015b). This also supports the concepts argued by Gindi et al. (2016) who stated that functional treatment objectives, leading to improved lives, are more important than pathological labeling and historical trauma re-enactment. Using an approach with a focus on defining a positive meaning to life can help move veterans' mindsets from the past to the present with a future oriented optimistic outlook.

Research reviewed in this project was consistent in stating that conventional treatments are often too historically focused on the trauma itself at the expense of more positive aspects in the present and future (Barr et al., 2019; Cramer et al., 2018; Feduccia et al., 2019; Garland et al., 2015a; Hamilton et al., 2016; Heath et al., 2017; Neukirch et al., 2018; Paige et al., 2018; Pearson et al., 2020; Polusny et al., 2018; Schnyder et al., 2015; Schure et al., 2018; Staples et al., 2013). This can be especially difficult for veterans with PTSD who harbor substantial stigmas against their perceived weakness over the trauma and their tendencies toward avoidance, depersonalization, and dissociation (van der Kolk, 2014). Therefore, researchers were strongly in support of abandoning an approach that focuses on what is wrong. Rather they advocated for taking a more positive approach of what is philosophically meaningful. In other words, what is right. Developing an internal locus of control, learning to cognitively re-appraise dysfunctional thought patterns, finding a mission and purpose that is meaningful to veterans in life is a more

effective approach to addressing stigma and shame, and ultimately, in resolving the PTSD symptoms. Additionally, this eudiamonic approach ties in with military values of taking control and defining a clear mission, further blending culturally with veterans.

Incorporate Mindfulness-Based Practices

In research considered in the project, three underlying concepts were reported as important for therapists to consider when treating veterans with PTSD: reducing SNS and HPA activation, addressing stigma and shame, and engaging veterans to embrace a eudiamonic approach. Researchers clearly, and consistently, stated that mindfulness-bases practices have provided clear and favorable results in achieving these concepts. Mindfulness-based practices, whether cognitive or somatic, showed positive outcomes in veterans studied in reducing the effects of PTSD symptoms and co-morbidities. They also were effective in reducing perceived stigma and shame, allowing veterans with PTSD to feel more comfortable investing themselves into these practices.

Several traits of mindfulness-based practices were consistently reported by authors in this study as being important to be included in therapeutic settings, which are now synthesized. First, particularly beneficial were mindfulness-based practices that provided the opportunity for group interaction. The key for success in utilizing groups was that they were comprised of fellow veterans with PTSD. This shared connection was important for overcoming shame, reducing isolation, and helping veteran to realized that they are not weak or alone. Second, mindfulness-based treatments were effective in reducing PTSD symptoms, in part, because they did not directly focus on historical trauma re-enactment or exposure. Rather, they indirectly focused on the trauma through interoceptive processes and releasing stored psychosomatic tensions. Third, internal locus of control. From a military mindset, accepting control for responsibility is

important. Helping veterans to take control of their cognitive processes in adaptative, constructive ways through a present moment focus with a positive mindset was reported as important. Fourth, using practices that embrace the warrior spirit through movement was beneficial. Fifth, providing guidance on how to engage the mind, body, and spirit in a holistic concept is a central underlying aspect of mindful activities and was reported to be great importance for therapists to embrace.

Finally, research articulated that mindfulness-based practices can be used alone or in combination with the VA's *strongly* recommended conventional treatments. As previously mentioned, the recommended practices have been shown effective with some veterans (VA/DOD, 2017). However, the dropout rates and lack of effectiveness in the majority of veterans with PTSD cannot be overlooked (Cushing & Braun, 2018; Mitt et al., 2014; Steenkamp, 2016; Watts et al., 2014). By drawing from the benefits outlined in this project with mindfulness-based practices, authors suggested that these practices can be blended into the therapeutic mix with the strongly recommended treatments. This can provide a holistic, symbiotic treatment plan that seeks to address stigma upfront and provide the most comprehensive treatment based on research-driven evidence-based practices.

Recommendations for Research

Given the high rates of PTSD in veterans, and particularly the alarming rate of veteran suicides, it is imperative for researchers to dedicate practical research effort to helping veterans who have served this country to more effectively live meaningful lives free from the devastation of PTSD. During the course of this study, numerous additional opportunities for research were noted. These opportunities include four areas of need. First, PTSD has been labeled a disorder; however, some researchers and experts in the field questioned this (Shalev, 2007; Syme &

Hagan, 2019). They suggested that PTSD is a normal, well-adjusted coping mechanism and should be labeled as such. Second, although it is clear that mindfulness-based practices benefit veterans, it is not clear how many veterans actually practice them. Third, mindfulness-based practices have been shown effective in helping prevent PTSD if engaged during the latent period; however, more studies would be valuable by evaluating how to incorporate them into active military units with return to duty considerations in mind. Fourth, more research on issues pertaining to treating genders would be valuable. Each of these will now be discussed.

First, is PTSD a mental health disorder? Throughout this study authors suggested that PTSD should be not considered a disorder. Rather it should be considered the mind and body's method of surviving traumatic experiences. Syme and Hagan (2019) and Shalev (2007) considered that PTSD should be looked at as disturbance of recovery from the early and normal response to traumatic events. By revising the concept from PTSD being labeled as a disorder to that of a strong coping mechanism, it could help veterans to abandon the concept that they are weak and feel shame, reducing their avoidance and suppressive efforts toward treatment. It also might help them to better address the resulting effects of witnessing traumatic events and be more likely to look at positive oriented practices such as mindfulness. This could provide greater relief for more veterans (Syme & Hagan, 2019)

Second, although mindfulness practices have shown significant results for proactively and retroactively managing combat stress and PTSD, there is no research providing an analysis of how many veterans with PTSD engage in mindfulness practices formally or informally (Hamilton et al., 2016; Heath et al., 2017). It is necessary to understand how many veterans with PTSD use these practices and how many do not. Having this data would allow for a targeted approach to educate veterans on the benefits of mindfulness-bases practices. Additionally,

veterans who have not tried mindfulness programs could be educated on the wide variety of mindfulness programs that exist. This could help veterans to select a practice that minimizes their feelings of stigma and shame and is best suited for their unique mindset and preferences.

Third, research that focuses on the impact of mindfulness-based practices being used proactively during the latent period would be beneficial. If using mindfulness practices during this critical period are indeed effective as authors in this project suggested, then PTSD could potentially be significantly reduced. This would involve a coordinated research effort with the military, as it would involve active duty military staff. A balance must occur with the military's need for prompt RTD and the concern of long-term effects (and cost) of PTSD. As discussed, mindfulness practices are thought to be beneficial for use during the latent period. These practices focus on the present moment, help to develop self-awareness, and are suitable for reducing rumination on past traumatic events, all of which could help the person resolve the trauma in real time, avoiding the future development of historically-based PTSD (APA, 2017; Barr et al., 2019; Cramer et al., 2018; Neukirch et al., 2018; Omidi et al., 2013; Stephenson et al., 2016).

Finally, articles included in the SLR did not specifically consider variances due to race, age, or culture, which would be of benefit for future exploration. Gender was covered in Chapter Two of this doctoral project, where it was reported that hormonal differences between men and women, resulting from stress reactivity, diverge considerably. Additionally, it was noted that the predominant causal factors of PTSD vary between men and women. PTSD in men results more from combat trauma itself, whereas, women's PTSD results predominantly from sexual harassment. Surprisingly, given the different casual factors of PTSD between men and women,

authors in this SLR suggested that treatments can still be the same. It would be valuable to specifically explore this with further empirical research.

Conclusions

The VA has prescribed *strongly* recommended treatments for veterans with PTSD, including CBT, EMDR, CPT, and PET (VA, 2020; VA/DOD, 2017). However, 40% of veterans do not seek treatment at all, 70% of veterans find little or no relief from symptoms from treatments, and up to 62% of veterans drop out of the treatments once they have begun (Cushing & Braun, 2018; Mitt et al., 2014; Steenkamp, 2016; Watts et al., 2014). In other words, according to these authors, the vast majority of veterans are not positively impacted by the strongly recommended treatments. This occurs in large part due to inherent stigmas and shame toward mental health in veteran populations. Given that PTSD, suicide, and substance use rates are higher than the general population, the strongly recommended treatments are failing the very people who have served our country.

This doctoral project sought to investigate the effectiveness of mindfulness-based treatments to provide practicing psychotherapists with research based best practices suitable for veterans with PTSD. Results from this project are encouraging. Mindfulness-based practices, whether cognitive or somatic, were shown to decrease the effects of stress reactivity, leading to improvements in PTSD symptoms and co-morbidities. Eight themes emerged that provided empirical support for the mechanisms behind mindfulness-based practices. By incorporating mindfulness-based practices, psychotherapists can work with veterans to engage in the treatment process by addressing perceived feelings of shame and stigma. By helping veterans to find inner calmness, embrace a present moment internal locus of control mindset, develop interoceptive abilities, focus on eudiamonic outcomes, and improve brain functioning, the detrimental effects

of SNS and HPA activation can be checked, helping our service members to truly find relief. There can be no better way to thank veterans for their service, than by helping them to obtain positive oriented treatments while maintaining their dignity through the warrior spirit.

References

Abdallah, C.G., Averill, L.A., Akiki, T.J., Raza, M., Averill, C.L., Gomaa, H., Adikey, A. & Krystal, J.H. (2019). The neurobiology and pharmacotherapy of posttraumatic stress disorder (PTSD). *Annual Review of Pharmacological Toxicology, 59*, 171-189. https://doi.org/10.1111/cpsp.12202

Amen, D.G. & Amen, T. (2016). *The brain warrior's way: Ignite your energy and focus, attack illness and aging, transform pain into purpose*. New American Publishing.

American Psychiatric Association (APA). (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.

American Psychiatric Association. (2017). *What is Posttraumatic Stress Disorder?* https://www.psychiatry.org/patients-families/ptsd/what-is-ptsd

American Psychological Association. (2017) *Clinical Practice Guidelines for the Treatment of Posttraumatic Stress Disorder.* https://www.apa.org/ptsd-guideline/ptsd.pdf

Arnsted, A.F.T., Raskind, M.A., Taylor, F.B., & Connor, D.F. (2015). The effects of stress exposure on prefrontal cortex: Translating basic research into successful treatments for post-traumatic stress disorder. *Neurobiology of Stress, 1*, 89-99. https://doi.org/10.1016/j.ynstr.2014.10.002

Badiuk, M.I., Shevchuk, O.S., Gutchenko, K.S., Biryuk, I.G., & Moldovan, T.E. (2016). The combat stress reaction as a scientific problem of the world, and its social and medical consequences. *Ukraine Military Medical Academy, 58*, 10-14.

Barr, N., Davis, J.P., Diguiseppi, G., Keeling, M., & Castro, C. (2019). Direct and indirect effects of mindfulness, PTSD, and depression in OEF/OIF veterans. *Psychological Trauma, 5*, 2-27. https://doi.org/10.1037/tra0000535

Baum, W. (2010). Mindfulness-based stress reduction: What it is, how it helps. *Psychology Today*. https://www.psychologytoday.com/us/blog/crisis-knocks/201003/mindfulness-based-stress-reduction-what-it-is-how-it-helps

Beauchaine, T.P., Theodore, P., Gatzke-Kopp, L., Mead, L., & Hilary, K. (2007). Polyvagal theory and developmental psychopathology: Emotion dysregulation and conduct problems from preschool to adolescence" *Biological Psychology*, 7 (2): 174–84. https://doi.org/10.1016/j.biopsycho.2005.08.008

Blakey, S. M., Wagner, H. R., Naylor, J., Brancu, M., Lane, I., Sallee, M., Kimbrel, N. A., VA Mid-Atlantic MIRECC Workgroup, & Elbogen, E. B. (2018). Chronic Pain, TBI, and PTSD in military veterans: A link to suicidal ideation and violent impulses? *The Journal of Pain: Official Journal of the American Pain Society*, *19*(7), 797–806. https://doi.org/10.1016/j.jpain.2018.02.012

Bonaz, B., Bazin T., & Pellissier, S. (2018). The vagus nerve at the interface of the microbiota-gut-brain axis. *Frontiers of Neuroscience, 12*, 49. https://doi.org/10.3389/fnins.2018.00049

Bremner, J.D., Mishra, S., Campanella, C., Shah, M., Kasher, N., Evans, S., Fani, N., Jasvant, A., Reiff, C., Davis, L., Vaccarino, V., & Carmody, J. (2017). 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. *Frontiers of Psychiatry, 8*. https://doi.org/10.3389/fpsyt.2017.00157

Castro, C.A., & Kintzle, S. (2014). Suicides in the military: The post-modern combat veteran and the Hemingway effect. *Current Psychiatry Reports, 16,* 1-9. https://doi.org/10.1007/s11920-014-0460-1

Cesur, R., Sabia, J.J., & Tekin, E. (2011). *The psychological costs of war: Military combat and mental health.* National Bureau of Economic Research. https://www.nber.org/papers/w16927.pdf

Chen, Y.R., Hung, K.W., Tsai, J.C., et al. (2014). Efficacy of eye movement desensitization and reprocessing for patients with posttraumatic stress disorder: A meta-analysis of randomized controlled trials. *PLOS One, 9*(8), 1-17. https://doi.org/10.1371/journal.pone.0103676

Cook-Cottone, C., & Guyker, W.M. (2018). The development and validation of the mindful self-care scale (MSCS): An assessment of practices that support positive embodiment. *Mindfulness, 9,* 161-175. https://doi.org/10.1007/s12671-017-0759-1

Cramer, H., Anheyer, D., Saha, F. J., & Dobos, G. (2018). Yoga for posttraumatic stress disorder–a systematic review and meta-analysis. *BMC psychiatry, 18*(1), 72. https://doi.org/10.1186/s12888-018-1650-x

Creswell, J. W., & Creswell, D. J. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage Publications.

Crum, A.J., Akinola, M., Martin, A., & Fath, S. (2017). The role of stress mindset in shaping cognitive, emotional, physiological responses to challenging and threatening stress. *Anxiety, Stress, & Coping*, 1-17. https://doi.org/10.1080/10615806.2016.1275585

Cushing, R.E., & Braun, K.L. (2018). Mind-body therapy for military veterans with post-traumatic stress disorder: A systematic review. *The Journal of Alternative and Complementary Medicine, 24*(2), 106-114. https://doi.org/10.1089/acm.2017.0176

Edgecomb, J.B., & Kerner, B. (2016). Medically unexplained somatic symptoms an bipolar spectrum disorders: A systematic review and meta-analysis. *Journal of Affective Disorders, 204*, 205-213. https://doi.org/10.1016/j.jad.2016.029

Eisler, M. (2018). *What's the difference between meditation and mindfulness? The Chopra Center.* https://chopra.com/articles/whats-the-difference-between-meditation-and-mindfulness

Elbogen, E.B., Wagner, H.R., Kimbrel, N.A., et al. (2018). Risk factors for concurrent suicidal ideation and violent impulses in military veterans. *Psychological Assessment, 30*(4), 425-435. https://doi.org/10.1037/pas0000490

Etkin, A., & Wager, T.D. (2007). Functional neuroimaging of anxiety: a meta-analysis of emotional processing in PTSD, social anxiety disorder, and specific phobia. *American Journal of Psychiatry, 164*(10), 1476-1488. https://doi.org/10.1176/appi.ajp.2007.07030504

Feduccia, A. A., Jerome, L., Yazar-Klosinski, B., Emerson, A., Mithoefer, M. C., & Doblin, R. (2019). Breakthrough for trauma treatment: Safety and efficacy of MDMA-assisted psychotherapy compared to Paroxetine and Sertraline. *Frontiers in Psychiatry*, *10*, 650. https://doi.org/10.3389/fpsyt.2019.00650

Fogger, S.A., Moore, R., & Pickett, L. (2016). Posttraumatic stress disorder and veterans: Finding hope and supporting healing. *The Journal for Nurse Practitioners, 12*(5), 598-604. https://doi.org/10.1016/j.nurpra.2016.07.014

Fraher, A.L., & Branicki, L. (2017). Mindfulness in action: Discovering how U.S. Navy SEALs build capacity for mindfulness in high-reliability organizations (HROS). *Academy of Management Discoveries, 3*(3), 239-261. https://doi.org/10.5465/amd.2014.0146

Fukuzawa, A, & Inamasu, K. (2020). Relationship between the internal locus of control and collective action: A comparison of East Asian and Western Countries. *Asian Journal of Social Psychology, 4*, 1-11. https://doi.org/10.1111/ajsp.12406

Garfinkel, S.N., & Critchley, H.D. (2015). *Brain mapping*. Elsevier.

Garland, E., Farb, N.A., Goldin, P.R., Fredrickson, B.L. (2015a). The mindfulness-to-meaning theory: Extensions, applications, and challenges at the attention–appraisal–emotion interface. *Psychological Inquiry, 26*(4). 377-387. https://doi.org/10.1080/1047840X.2015.1092493

Garland, E. L., Farb, N. A., Goldin, P., & Fredrickson, B. L. (2015b). Mindfulness broadens awareness and builds eudaimonic meaning: A process model of mindful positive emotion regulation. *Psychological inquiry*, *26*(4), 293–314. https://doi.org/10.1080/1047840X.2015.1064294

Gindi, S., Galilib, G., Volovic-Shushanc, S., & Adir-Pavisc, S. (2016). Integrating occupational therapy in treating combat stress reaction within a military unit: An intervention model. *Work, 55*, 737-745. https://doi.org/10.3233/WOR-162453

Goldstein, J.M., Jerram, M., Abbs, B., Whitfield-Gabrieli, S., & Makris, N. (2010). Sex differences in stress response circuitry activation dependent on female hormonal cycle. *Journal of Neuroscience, 30*(2), 431-438. https://doi.org/10.1523/JNEUROSCI.3021-09.2010

Goyal M., Singh S., Sibinga S., et al. (2014). Meditation programs for psychological stress and well-being: A systematic review and meta-analysis. *Journal of the American Medical Association*, 174(3), 357–368. https://doi.org/10.1001/jamainternmed.2013.13018

Gradus, J. (2020). *Epidemiology of PTSD.* https://www.ptsd.va.gov/professional/treat/essentials/epidemiology.asp

Greenberg, J.S. (2017). *Comprehensive Stress Management* (14th ed.). McGraw Hill.

Greenberg, J., Romero, V.L., Elkin-Frankston, S., Bezdek, M., Schumacher, E., & Lazar, S.W. (2019). Reduced interference in working memory following mindfulness training is associated with increases in hippocampal volume. *Brain Imaging and Behavior 13*, 366–376. https://doi.org/10.1007/s11682-018-9858-4

Hamilton, J.A., Coleman, J.A., & Davis, W.J. (2016). Leadership perspectives of stigma-related barriers to mental health care in the military. *Military Behavioral Health, 5*, 81-90. https://doi.org/10.1080/21635781.2016.1257964

Hansen, M., Műllerová, J., Elklit, A., & Armour, C. (2016). Can the dissociative PTSD subtype be identified across two distinct trauma samples meeting caseness for PTSD? *Social Psychiatry and Psychiatric Epidemiology, 51*(8), 1159-1169. https://doi.org//10.1007/s00127-016-1235-2

Harrison, E. (2017). *The foundations of mindfulness: How to cultivate attention, good judgment, and tranquility*. The Experiment.

Haviland, M. G., Banta, J.E., Sonne, J.L., & Przekop, P. (2016). Posttraumatic stress disorder-related hospitalizations in the United States (2002–2011): Rates, co-occurring illnesses, suicidal ideation/self-harm, and hospital charges. *Journal of Nervous and Mental Disorders, 204*(2), 78-86. https://doi.org/10.1097/NMD.0000000000000432

Heath, P., Seidman, A., Vogel, D. Cornish, M., & Wade, N. (2017). Help-seeking stigma among men in the military: The interaction of restrictive emotionality and distress. *Psychology of Men & Masculinity, 18*, 1-6. https://doi.org/10.1037/men0000111

Heffner, K,L, Crean, H.F, & Kemp, J.E. (2016). Medication programs for veterans with Posttraumatic stress disorder: Aggregate findings from a multi-site evaluation. *Psychological Trauma: Theory, Research, Practice, and Policy, 8*(3), 365-374. http://dx.doi.org/10.1037/tra0000106

Hilton, L., Maher, A. R., Colaiaco, B., Apaydin, E., Sorbero, M. E., Booth, M., & Hempel, S. (2017). Meditation for posttraumatic stress: Systematic review and meta-analysis. *Psychological Trauma: Theory, Research, Practice, And Policy, 9*(4), 453-460. https://doi.org/10.1037/tra0000180

Holmes, R., & Snape, I. (2019). Effectiveness of treatments of veterans with PTSD: A critical review. *Journal of Experiential Psychotherapy, 22*, 1-14.

Hourani, L, Tueller, S., Kizakevich, P., Lewis, G., Strange, L., Weimer, B., Bryant, S., Bishop, E., Hubal, R. Spira, J. (2016). Toward preventing post-traumatic stress disorder: Development and testing of a pilot predeployment stress inoculation training program, *Military Medicine*, 181(9), 1151-1160. https://doi.org/10.7205/MILMED-D-15-00192

Johnston, J.M., Minami, T., Greenwald, D., Li, C., & Reinhard, K. (2015). Yoga for military service personnel with PTSD: A single arm study. *Psychological Trauma: Theory, Research, Practice, and Policy, 7*(6), 555-562. https://doi.apa.org/doiLanding?doi=10.1037%2Ftra0000051

Kang, S.S., Erbes, C.R., Lamberty, G.J., Polusny, M.A., Moran, A.C., Van Voorhis, A.C., & Lim, K.O. (2018). Transcendental meditation for veterans with post-traumatic disorder. *Psychological Trauma, 10*(6), 675-680. https://doi.org/10.1037/tra0000346

Katharina, D. et al. (2014). The predictive value of somatic and cognitive depressive symptoms for cytokine changes in patients with major depression. *Neuropsychiatric Disease & Treatment, 10*, 1191-1197. https://doi.org/10.2147/NDT.S61640

Kearney, D. J., Malte, C. A., McManus, C., Martinez, M. E., Felleman, B., & Simpson, T. L. (2013). Loving-kindness meditation for posttraumatic stress disorder: A pilot study. *Journal of Traumatic Stress, 26*, 426-434. https://doi.org/10.1002/jts.21832

Kelmendi, B., Adams, T.G., Southwick, S., Abdallah, C.G., & Krystal, J.H. (2017). Posttraumatic stress disorder: An integrated overview and neurobiological rationale for pharmacology. *Clinical Psychologist, 24*(3), 281-297. https://doi.org/10.1111/cpsp.12202

Kelmendi, B., Adams, T.G., Yarnell, S., Southwick, S., Abdallah, C.G., & Krystal, J.H. (2016). PTSD: From neurobiology to pharmacological treatments. *European Journal of Psychotraumatology, 7*(1), 1-11. https://doi.org/10.3402/ejpt.v7.31858

Lang, A.J., Casmar, P., Hurst, S., Harrison, T., Golshan, S., Good, R., Essex, M., & Negi, L. (2020). Compassion meditation for veterans with posttraumatic stress disorder: A nonrandomized study. *Mindfulness, 11,* 63-74. https://doi.org/10.1007/s12671-017-0866-z

Lee, D. J., Schnitzlein, C. W., Wolf, J. P., Vythilingam, M., Rasmusson, A. M., & Hoge, C. W. (2016). Psychotherapy versus pharmacotherapy for posttraumatic stress disorder: Systemic review and meta-analyses to determine first-line treatments. *Depression and Anxiety, 33*(9), 792–806. https://doi.org/10.1002/da.22511

Leong, H.T., Fu, S., Ng, G.Y.F., & Tsang, W.W.N. (2011). Low-level Taekwondo practitioners have better somatosensory organization in standing balance than sedentary people. *European Journal of Applied Physiology, 111*(8), 1787-1793. https://doi:10.1007/s00421-010-1798-7

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gotzsche, P. C., Ioannidis, J. P., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *PLOS Medicine, 6*(7). http://doi.org/10.1371/journal.pmed.1000100

Lindsey, E.K., & Creswell, J.D. (2019). Mindfulness, acceptance, and emotion regulation: Perspectives from Monitor and Acceptance Theory (MAT). *Science Direct, 28*, 120-125. https://doi.org/10.1016/j.copsyc.2018.12.004

Lukoff, D., & Stozzi-Heckler, R. (2017). Aikido: A martial art with mindfulness, somatic, relational, and spiritual benefits for veterans. *Spirituality in Clinical Practice, 4*(2), 81-91. https://doi.org/10.1037/scp0000134

Luu, K., & Hall, P. A. (2017). Examining the acute effects of hatha yoga and mindfulness meditation on executive function and mood. *Mindfulness*, *8*(4), 873-880. https://doi.org/10.1007/s12671-016-0661-2

MacLean, K.A., Ferrer, E., Aichele, S.R., et al. (2010). Intensive meditation training improves perceptual discrimination and sustained attention. *Psychological Science, 12*, 1-11. https://doi.org/10.1177/0956797610371339

Markowitz, J.C., Petkova, E., Neria, Y., et al. (2015). Is exposure necessary? A randomized clinical trial of interpersonal psychotherapy for PTSD. *American Journal of Psychiatry, 172*, 430–40. https://doi.org/10.1176/appi.ajp.2014.14070908

Mazzucchelli, T., Kane, R., & Rees, C.S. (2010). Behavioral activation interventions for well-being: A meta-analysis. *The Journal of Positive Psychology, 5*, 105-121. https://doi.org/10.1080/17439760903569154

McCarthy, L., Fuller, J., Davidson, G., Crump, A., Positano, S., & Alderman, C. (2017). Assessment of yoga as an adjuvant treatment for combat-related posttraumatic stress disorder. *Australasian Psychiatry, 25*(4), 354–357. https://doi.org/10.1177/1039856217695870

McKibben, E.C, & Nan, K.M.J. (2017). Enhancing holistic identity through yoga: Investigating body-mind-spirit interventions on mental illness stigma across culture–A case study. *Open Journal of Nursing*, 7, 481-494. https://doi.org/10.4236/ojn.2017.74038.

Mehling, W. E., Chesney, M. A., Metzler, T. J., Goldstein, L. A., Maguen, S., Geronimo, C., & Neylan, T. C. (2018). A 12-week integrative exercise program improves self-reported mindfulness and interoceptive awareness in war veterans with posttraumatic stress symptoms. *Journal of Clinical Psychology, 74*(4), 554-565. https://doi.org/10.1002/jclp.22549

Mithoefer, M. C., Mithoefer, Mithoefer, A. T., Feduccia, A. A., Jerome, L., Wagner, M., Wymer, J., Holland, J., Hamilton, S., Yazar-Klosinski, B., Emerson, A., & Doblin, R. (2018). 3,4-Methylenedioxymethamphetamine (MDMA)-assisted psychotherapy for post-traumatic stress disorder in military veterans, firefighters, and police officers: A randomized, double-blind, dose-response, Phase 2 clinical trial. *The Lancet Psychiatry, 5(6), 486-497.* https://doi.org/10.1016/S2215-0366(18)30135-4

Mitt, J. M., Mondragon, S., Hundt, N. E., Beason-Smith, M., Grady, R. H., & Teng, E.J. (2014). Characteristics of U.S. veterans who begin and complete prolonged exposure and cognitive processing therapy for PTSD. *Journal of Traumatic Stress, 27*(3), 265-273. https://doi.org/10.1002/jts.21927

Moraes, L.J., & Miranda, M.B. (2017). A systematic review of psychoneuroimmunology-based interventions. *Psychology, Health, and Medicine, 23*(3), 1-8. https://doi.org/10.1080/13548506.2017.1417607

Neukirch, N., Reid, S., & Shires, A. (2018). Yoga for PTSD and the role of interoceptive awareness: A preliminary mixed-methods case series study. *European Journal of Trauma and Dissociation, 3*(1), 2-9. https://doi.org/10.1016/j.ejtd.2018.10.003

Niles, B.L., Mori, D.L., Polizzi, C.P., Kaiser, A.P., Ledoux, A.M., & Wang, C. (2016). Feasibility, qualitative findings and satisfaction of a brief Tai Chi mind–body programme for veterans with post-traumatic stress symptoms. *British Medical Journal Open, 6*, 1-10. https://doi.org/10.1136/bmjopen-2016-012464

Olff, M. (2017). Sex and gender differences in post-traumatic stress disorder: An update. *European Journal of Psychotraumatology, 8*. https://doi.org/10.1080/20008198.2017.1351204

Omidi, A., Mohammadi, A., Zargar, F., & Akbari, H. (2013). Efficacy of mindfulness-based stress reduction on mood states of veterans with post-traumatic stress disorder. *Archives of Trauma Research, 1*(4), 151-154. https://doi.org/10.5812/atr.8226

Paige, L., Renshaw, K., Allen, E.S., & Litz, B.T. (2019). Deployment trauma and seeking treatment for PTSD in U.S. soldiers. *Military Psychology, 31*(1). https://doi.org/10.1080/08995605.2018.1525219

Pasco, M.C., Thompson, D.R., & Ski, C.F. (2017). Yoga, mindfulness-based stress reduction and stress-related physiological measures: A meta-analysis. *Psychoneuroendocrinology, 86,* 152-168. https://doi.org/10.1016/j.psyneuen.2017.08.008

Pearson, E.J., Madigan, A., Spencer-Harper, L., Hatton, P., & Murphy, D. (2020). My invisible PTSD: Exploring the experiences of recovery in treatment seeking veterans. *Journal of Veterans Studies, 5*, 1-15. https://doi.org/10.21061/jvs.v5i1.123

Polusny, M.A., Erbes, C.R., Thuras, P., Moran, A., Lamberty, G.J., Collins, R.C., Rodman, J.L., & Lim, K.O. (2015). Mindfulness-based stress reduction for posttraumatic stress disorder among veterans: A randomized clinical trial. *The Journal of the American Medical Association, 314*(5), 456-465. https://doi.org/10.1001/jama.2015.8361

Porges, S.W. (2011). *The Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, Communication, and Self-regulation*. Norton & Company: New York, NY.

Porges, S.W. (2001). The polyvagal theory: phylogenetic substrates of a social nervous system" *International Journal of Psychophysiology*, *42* (2), 123–146. https://doi.org/10.1016/S0167-8760(01)00162-3.

Porges, S.W., Doussard-Roosevelt, J.A., & Maiti, A.K. (1994). Vagal tone and the physiological regulation of emotion. *Monographs of the Society for Child Development, 59*(2-3). 167-186. https://doi.org/10.1111/j.1540-5834.1994.tb01283.x

Privitera, G. (2018). *Statistics for the Behavioral Sciences*. (3rd ed.). SAGE Publications.

Raman, G., Zhang, Y., Minichiello, V.J., et al. (2013). Tai Chi improves sleep quality in healthy adults and patients with chronic conditions: A systematic review and meta-analysis. *Journal of Sleep Disorder Therapy, 2,* 141. https://doi.org/10.4172/2167-0277.1000141

Rios, S.O., Mark, J. Estevan, I., & Barnett, L.M. (2017). Health benefits of martial arts in adults: A systematic review. *Journal of Sports Sciences*, 1-9. https://doi.org/10.1080/02640414.2017.1406297

Robinson, A.M. (2018). Let's talk about stress: History of stress research. *Review of General Psychology, 22*(3), 334-342. https://doi.org/10.1037/gpr0000137

Rodrigues P.M., & Correa Leite, P.E. (2016). The involvement of the parasympathetic and sympathetic nerve in the inflammatory reflex. *Journal of Cellular Physiology, 231*, 1869. https://doi.org/10.1002/jcp.25307

Rodriquez, E. J., Livaudais-Toman, J., Gregorich, S. E., Jackson, J. S., Nápoles, A. M., & Pérez-Stable, E. J. (2018). Relationships between allostatic load, unhealthy behaviors, and depressive disorder in U.S. adults. *Preventive medicine*, *110*, 9–15. https://doi.org/10.1016/j.ypmed.2018.02.002

Rotenberg, S., & McGrath, J.J. (2016). Inter-relation between autonomic and HPA axis activity in children and adolescents. *Biological Psychology, 117*, 16-25. https://doi.org/10.1016/j.biopsycho.2016.01.015

Russell, M.C., & Figley C.R. (2017). Do the military's frontline psychiatry/combat operational stress control programs benefit veterans? Part two: Systematic review of the Evidence. *Psychological Injury and Law, 10,* 24-71. https://doi.org/10.1007/s12207-016-9279-x

Schnyder, U., Ehlers, A., Elbert, T., Foa, E. B., Gersons, B. P. R., Resick, P. A., Shapiro, F., & Cloitre, M. (2015). Psychotherapies for PTSD: What do they have in common? *European Journal of Psychotraumatology, 6*(1). https://doi.org/10.3402/ejpt.v6.28186

Schure, M.B., Simpson, T.L., Martinez, M., Sayre, G., & Kearney, D.J. (2018). Mindfulness-based processes of healing for veterans with post-traumatic stress disorder. *Journal of Complementary Medicine, 24*(11), 1063-1068. https://doi.org/10.1089/acm.2017.0404

Seppala, E. M., Nitschke, J. B., Tudorascu, D. L., Hayes, A., Goldstein, M. R., Nguyen, D. H., & Davidson, R. J. (2014). Breathing-based meditation decreases posttraumatic stress disorder symptoms in U.S. military veterans: A randomized controlled longitudinal study. *Journal of Traumatic Stress, 27*, 397-405. https://doi.org/10.1002/jts.21936

Sessa, B. (2017). MDMA and PTSD treatment. *Neuroscience Letters, 649*, 176-180. https://doi.org/10.1016/j.neulet.2016.07.004

Shalev, A. Y. (2007). *PTSD: A disorder of recovery?* In Kirmayer, L.J., Lemelson, R., & Barad, M. (Eds.), *Understanding Trauma: Integrating Biological, Clinical, and Cultural Perspectives* (p. 207–223). Cambridge University Press. https://doi.org/10.1017/CBO9780511500008.015

Shapiro, J., Kasman, D., & Shafer, A. (2006). Words and wards: a model of reflective writing and its uses in medical education. *Journal of Medical Humanities*, *27*(4), 231-244. https://doi.org/10.1007/s10912-006-9020-y

Smith, E.N., Young, M.D., & Crum, A.J. (2020). Stress, mindsets, and success in Navy SEALs special warfare training. *Frontiers in Psychology, 10.* https://doi.org/10.3389/fpsyg.2019.02962

Solloway, M., Taylor, S., Shekelle, P., Miake-Lye, I., Beroes, J., Shanman, R., & Hempel. S. (2016). An evidence map of the effect of Tai Chi on health outcomes. *Systematic Reviews, 5*, 1-12. https://doi.org/10.1186/s13643-016-0300-y

Staples, J.K., Hamilton, M.F., & Uddo, M. (2013). A yoga program for the symptoms of post-traumatic stress disorder in veterans. *Military Medicine, 178*(8), 854-860. https://doi.org/10.7205/MILMED-D-12-00536

Steenkamp, M. M. (2016). True evidence-based care for posttraumatic stress disorder in military personnel and veterans. *JAMA Psychiatry, 73*(5), 431-432. https://doi.org/10.1001/jamapsychiatry.2015.2879

Stephens, M.C., Mahon, P.B., McCaul, M.E., & Wand, G.S. (2016). Hypothalamic-pituitary-adrenal axis response to acute psychosocial stress: Effects of biological sex and circulating hormones. *Psychoneuroendocrinology, 66*, 47-55. https://doi.org/10.1016/j.psyneuen.2015.12.021

Stephenson, K.R., Simpson, T.L., Martinez, M.E., & Kearney, D.J. (2016). Changes in mindfulness and posttraumatic stress disorder symptoms among veterans enrolled in mindfulness-based stress reduction. *Journal of Clinical Psychology*, 1-17. https://doi.org/10.1002/jclp22323

Straub, R.H., & Cutolo, M. (2017). Psychoneuroimmunology: Developments in stress research. *Wien Med Wochenschr, 168*(3), 76-84. https://doi.org/10.1007/s10354-017-0574-2

Street, A.E., Gradus, J.L., Giasson, H.L., Vogt, D., & Resick, P.A. (2013). Gender differences among veterans deployed in support of the wars in Afghanistan and Iraq. *Journal of General Internal Medicine, 28*(2), 556-562. https://doi.org/10.1007/s11606-013-2333-4

Streeter, C.C., Gerbarg, P.L., Saper, R.B., Ciraulo, D.A., & Brown, R.P. (2012). Effects of yoga on autonomic nervous system, gamma-aminobutyric acid, and allostasis in epilepsy, depression, and post-traumatic stress disorder. *Medical Hypotheses, 78*(5):571-9. https://doi.org/10.1016/j.mehy.2012.01.021

Stefanovics, E.A., & Rosenheck, R.A. (2020). Gender differences in outcomes following specialized intensive PTSD treatment in the Veterans Health Administration. *Psychological Trauma: Theory, Research, Practice, and Policy, 12*(3), 272-280. https://doi.org/https://doi.org/10.1037/tra0000495

Stern, J. (2014). PTSD: Policy issues. *Psychoanalytic Psychology, 31*(2), 255-261. http://doi.org/10.1037/a0036008

Strainge, L., Sullivan, M.C., Blackmon, J.E., Cruess, S.E., Wheeler, D., & Cruess, D.G. (2019). PROMIS – assessed sleep problems and physical health symptoms in adult psychiatric inpatients. *Health Psychology, 38*(5), 376-385. https://doi.org/10.1037/heal00000651

Sue, D., Sue, D.W., Sue, D., & Sue, S. (2016). *Understanding abnormal behavior* (11th ed.). Cengage Learning.

Syme, K.L, & Hagen, E.H. (2019). Mental health is biological health: Why tackling "diseases of the mind" is an imperative for biological anthropology in the 21st century**.** *American Journal of Physical Anthropology*, 171(70). https://doi.org/10.1002/ajpa.23965

Tomlinson, E.R., Yousaf, O., & Vitterso, A.D. (2018). Dispositional mindfulness and psychological health: A systematic review. *Mindfulness, 9*, 23-43. doi:10.1007/s12671-017-0762-6

Tudge, J.R., Payir, A., Mercon-Vargas, E., & O'Brien, L. (2017). Still misused after all these years? A reevaluation of the uses of Bronfenbrenner's bioecological theory of human development. *Journal of Family Theory and Review, 8*, 427-445. https://doi.org/10.1111/jftr.12165

Turakitwanakan, W., Mekseepralard, C., & Busarakumtragul, P. (2013). Effects of mindfulness meditation on serum cortisol of medical students. *Journal of the Medical Association of Thailand, 96,* 90-95.

U.S. Department of Veterans Affairs (VA/DOD). (2017). *VA/DoD Clinical Practice Guidelines*. www.healthquality.va.gov/guidelines/MH/ptsd/VADoDPTSDCPGFinal012418.pdf

U.S. Department of Veterans Affairs. (2020). *PTSD Basics.* https://www.ptsd.va.gov/apps/decisionaid/introduction-2.aspx

Valiente-Gomez, A., Moreno-Alcazar, A., Treen, D., Cedron, C., Colom, F., Perez, V., & Amann, B.L. (2016). EMDR beyond PTSD: A systematic literature review. *Frontiers of Psychology, 26*. https://doi.org/10.3389/fpsyg.2017.01668

Van der Kolk, B. (2014). *The Body Keeps the Score: Brain, Mind, and Body in the Healing of Trauma.* Penguin.

Vance, M. C. (2017). Treating a veteran who has PTSD. *Focus (American Psychiatric Publishing)*, *15*(4), 429–431. https://doi.org/10.1176/appi.focus.20170036

Velez-Agosto, N.M, Soto-Crespo, J.G., Vizcarrondo, S., Vega-Molina, S., & Coll, C.G. (2017). Bronfenbrenner's bioecological theory revision: Moving culture from the macro to the micro. *Perspectives in Psychological Science, 12*(5), 900-910. https://doi.org/10.1177/1745691617704397

Verma, R., Singh-Balhara, Y.P., & Gupta, C.S. (2011). Gender differences in stress response: Role of developmental and biological determinants. *Industrial Psychiatry Journal, 20*(1), 4-10. https://doi.org/10.4103/0972-6748.98407

Vogus, T.J., & Sutcliffe, K.M. (2017). Commentary on mindfulness in action: Discovering how U.S. Navy SEALs build capacity for mindfulness in high-reliability organizations (HROS). *Academy of Management Discoveries, 3*(3), 324-326. https://doi.org/10.5465/amd.2014.0146

Walsh, E., Eisehlohr-Moul, T., & Baer, R. (2016). Brief mindfulness training reduces salivary IL-6 and TNF-α in young women with depressive symptomatology. *Journal of Consulting and Clinical Psychology, 84*(10), 887-897. https://doi.org/10.1037/ccp0000122.

Wang, F., Man, J., Lee, O., Wu, T., Benson, H., Fricchione, G., & Yeung, A. (2014). The effects of Tai Chi on depression, anxiety, and psychological well-being: A systematic literature review and meta-analysis. *International Journal of Behavioral Medicine, 21*, 605-617. https://doi.org/10.1007/s12529-013-9351-9

Watts, B. V., Shiner, B. S., Zubkoff, L., Carpenter-Song, E., Ronconi, J. M., & Coldwell, C. (2014). Implementation of evidence-based psychotherapies for posttraumatic stress disorder in VA specialty clinics. *Psychiatry Services, 65*(5), 648-653. http://doi.org/10.1176/appi.ps.201300176

Webster, C., Luo, A., Krageloh, C., Moir, F., & Henning, M. (2016). A systematic review of the health benefits of Tai Chi for students in higher education. *Preventive Medicine Reports, 3*, 103-112. https://doi.org/10.1016/j.pmedr.2015.12.006

Weiss, T., Chard, K., & Shumm, J. (2011). *Aikido as an augment to women's residential PTSD treatment.* Paper presented at the Association for Behavioral and Cognitive Therapies, Toronto, Canada.

West, J., Liang, B., & Spinazzola, J. (2017). Trauma sensitive yoga as a complementary treatment for posttraumatic stress disorder: A qualitative descriptive analysis. *International Journal of Stress Management, 24*(2), 173-195. https://doi.org/10.1037/str0000040

Willing, A.E., Girling, S.A., Deichert, R., Wood-Deichert, R., Gonzalez, J., Hernandez, D., Foran, E., Sanberg, P., & Kip, K. (2019). Brazilian Jiu Jitsu training for U.S. service members and veterans with symptoms of PTSD. *Military Medicine, 184*, 626-631. https://doi.org/10.1093/milmed/usz074

Wheelock, M.D., Rangaprakash, D., Harnett, N.G., Wood, K.H., Orem, T.R., Mrug, S., Granger, D.A., Deshpande, G., & Knight, D.C. (2018). Psychosocial stress reactivity is associated with decreased whole brain network efficiency and increased amygdala centrality. *Behavioral Neuroscience, 132*(6), 561-572. https://doi.org/10.1037/bne0000276

Wong, G., & Breheny, M. (2018). Narrative analysis in health psychology: A guide for analysis. *Advanced Methods in Health Psychology and Behavioral Medicine, 6*(1), 245-261. https://doi.org/10.1080/21642850.2018.1515017

Yuen, A.W., & Sander, J.W. (2017). Can natural ways to stimulate the vagus nerve improve seizure control? *Epilepsy and Behavior, 67*, 105-110. https://doi.org/10.1016/j.yebeh.2016.10.039