A unique approach in trauma-focused psychotherapy is the evolving field of Equine Assisted Therapy (EAT), a nontraditional, experiential methodology centered on the therapeutic benefits intrinsic in equines. While there is a plethora of anecdotal and qualitative studies showing effectiveness, evidence-based studies are limited, and those that exist have design and implementation flaws such as small sample size, no control group, lack of counselor-administered curriculum and/or assessments, leaving large empirical gaps. To address these gaps, a quasi-experimental nonrandomized control group design was implemented for this study. Fifty veterans participated with 25 assigned to each, intervention and control groups. Veterans in the intervention group completed 3-hour weekly EAT sessions for 10 weeks and those in the control group continued with treatment as usual. Standardized psychometric assessments were PTSD Checklist—Military Version (PCL-M) and Functional Assessment of Chronic Illness Therapy—Spiritual Well-Being Scale (FACIT-Sp). The ANCOVA revealed no significant difference in mean changes for PCL-M, $F(1, 43) = 3.255, p = .078$, partial $\eta^2 = .070$, which suggests a medium-small effect size, as well as for the FACIT-Sp, $F(1, 43) = .368, p = .547$, partial $\eta^2 = .008$, which suggests a small effect size. However, paired samples $t$-test showed significant reduction in PTSD symptom scores for intervention group when compared to control group. While no conclusion regarding efficacy can be made, the results may be a useful lens to further examine the potential benefits of incorporating a multidimensional, biopsychosocial-spiritual model which could leverage significant outcomes of holistic health for veterans with PTSD symptomology.
of the mental trauma (e.g., exhaustion, mental conflict) and its nature (e.g., neurosis; Shalev et al., 1996).

In the current DSM-5, PTSD is included in a new category, “Trauma- and Stressor-Related Disorders” (APA, 2013, p. 265). All PTSD symptom clusters included in this classification require exposure to or witnessing a traumatizing event (e.g., actual or threatened violence, injury, death, and/or actual or threatened sexual violence). The diagnostic criteria in the DSM-5 describes intrusion symptoms, avoidance, negative alterations in cognition and mood, alterations in arousal, and hyper-reactivity. The manual noted that the diagnostic criteria must be met for treatment, but it is possible to have partial PTSD. While partial PTSD or “subsyndromal PTSD” (Kornfield et al., 2012, p. 383) does not meet the full PTSD diagnostic criteria, if left untreated over a prolonged period, it could cause symptoms to become chronic and lead to full-blown PTSD (Kornfield et al., 2012). Additionally, previous traumatic experiences, gender, and age are also contributory factors in the development of PTSD (APA, 2013; VA, 2018b).

**Mental Health of Veterans**

The extended involvement in military conflict and multiple deployments has continued to place excessive demands on the mental health of military personnel (Lanning & Krenk, 2013). Besides PTSD, many veterans suffer from traumatic brain injury, chronic pain, and have long-term health issues from harmful exposure to pollutants and toxins (Maria et al., 2018). For example, since 2001 over two million Americans have served in Iraq (Operation Iraqi Freedom/OIF) and Afghanistan (Operation Enduring Freedom/OEF) with more than 800,000 serving multiple deployments (Fissette et al., 2014). The ongoing OIF/OEF conflicts have highlighted substantial increases of psychiatric disorders, depressive and anxiety disorders, as well as symptoms of PTSD (Bagalman, 2013). Most notably, the symptom severity among veterans with subsyndromal or full PTSD has continued to rise, with many veterans reporting significant symptomology many years after initial onset (Sharpless & Barber, 2011).

Further, the VA has reported the prevalence of PTSD with OIF/OEF veterans who received healthcare from 2002–2012 was 29% (Bagalman, 2013). Similarly, a report by the Institute of Medicine (2014) stated that in 2012 alone more than half million veterans of all combat eras in the U.S. sought care for PTSD through the VA healthcare services, and almost 24% of these veterans have served in the Afghanistan (OEF) and Iraq (OIF) conflicts.

In one study, Hoge et al. (2004) evaluated the risk related to PTSD in military combat personnel returning from deployments to Iraq and Afghanistan (N = 3,671). Results suggested that PTSD prevalence was positively correlated with combat experiences, such as rocket or mortar fire (87%); gunshot (80%); seeing dead bodies or human remains (65%); being attacked or ambushed (74%); and knowing someone seriously injured or killed (63%). These findings indicated that PTSD may be a highly prevalent disorder among U.S. service men and women returning from current military deployments, with prevalence estimates as high as 14%–16%. It has been suggested that these conflicts are “creating a new generation of veterans with high levels of PTSD and related mental health symptoms” (Monson et al., 2006, p. 898). In addition, prevalence rates are also likely affected by issues related to symptom overlap with other psychiatric disorders, sociopolitical, and cultural factors. Regardless of the “true” prevalence numbers, the disorder is associated with severe functional impairment and/or reduced quality of life for those who suffer from it (Richardson et al., 2010).

**Psychological Symptoms of Veterans Dealing with Trauma**

The psychological symptoms exhibited by veterans who struggle with combat and/or military experiences may occur long before a diagnosis of PTSD is made (APA, 2013). In addition, early warning signs that go undiagnosed or untreated include comorbid conditions such as depression, anxiety, hostility, insomnia, or substance abuse (Marx & Gutter, 2015). These varied and complex symptoms not only affect the veteran socially and emotionally, but also impact their work, family, and relationships, thereby diminishing their overall quality of life (APA, 2013).

Further results from the study by Hoge et al. (2004) of OIF/OEF veterans noted that there was a strong relationship between combat experience (i.e., being shot at or killing enemy combatants) and the prevalence of PTSD. For instance, service military members who were actively engaged in combat in these conflicts not only experienced traditional firefight, but they were also confronted with the continuous threat of being ambushed by “explosive devices, particularly the improvised explosive devices known as IEDs” (Hoge et al., 2004, p. 165). Secondary to these stressors, Hoge et al. noted they may have developed sustained anticipatory anxiety due to potential threats at any hour of the day, sometimes daily. Consequently, this constant combat-ready state has resulted in a pervasive and uncontrollable sense of danger (Friedman, 2006). As such, the lingering threats of harm from these primary and secondary stressors may have resulted in both complex psychological and physiological symptoms associated with the conflicts (Hoge et al., 2004; Friedman, 2006).

In another study, Gibbs et al. (2011) found veterans with mental health issues reported grave concerns about whether their peers considered them fit to fulfill their mission and many were also fearful of being perceived as weak or unreliable. Essentially, the stigma that has developed within the military culture has inhibited many service members and veterans from seeking treatment (Hoge et al., 2004). Whether intentional or not, the underlying stigmatization has permeated the military culture with both active duty and veteran members foregoing therapy in order to avoid the perceived adverse stereotyping of weakness and active duty career impact (Held & Owens, 2013). Thus, Held and Owens (2013) elucidated that this perceived weakness has created an erroneous attitude of disrespect towards the
individual in need of help, while the false strength or ignoring the trauma-related concerns was hyped.

Consequently, the complexity and severity of PTSD together with comorbidities, such as depression, anxiety, insomnia, or substance abuse as well as the associated stigma with mental health disorders has exacerbated the risk for suicide within this demographic.

**Veteran Suicide**

The recently published 2019 National Veteran Suicide Report indicated the number of veteran suicides has exceeded 6,000 each year from 2008 to 2017 (VA, 2019). In 2017, an average of 16.8 veterans died by suicide each day compared to an average of 15.9 deaths in 2005 (VA, 2019). Largely, this average number of veteran suicide deaths per day has equaled or exceeded 16.0 since 2007. In addition, the highest suicide rate in 2017 were veterans ages 18–34 years (i.e., 44.5 per 100,000; VA, 2019). Also in 2017, self-inflicted firearm injury was the method of suicide in 70.7% of male veteran suicide deaths and in 43.2% of female veteran suicide deaths (VA, 2019).

Further, the Veterans Health Administration patients diagnosed with PTSD from 2005 to 2017, the suicide rate increased (i.e., from 40+ per 100,000 to 50+ per 100,000; VA, 2019). A survey by Sher et al. (2012) with 407 veterans revealed that those who screened positive for PTSD were four times more likely to report suicidal ideation. Furthermore, the risk of suicide was almost six times higher in those with two or more coexisting psychiatric disorders. Thus, these findings are indicative that the coexistence of PTSD and depression increased the risk of suicidal ideation more than PTSD or depression alone. As such, screening for PTSD underscores the importance of early identification and effective treatment intervention to assess self-harm risk to help save lives (Sher et al., 2012).

**Therapeutic Interventions**

In an attempt to address mental health of veterans, the Department of Veterans Affairs (VA) and Department of Defense (DOD; 2017) have recommended individual, manu-

alized trauma-focused psychotherapies such as cognitive processing therapy (CPT; Resick & Schnicke, 1992), prolonged exposure therapy (PE; Foa et al., 2005), and eye movement desensitization reprocessing therapy (EMDR; Shapiro, 1989) as viable options for treating trauma for their proven reliability, validity, and generalizability to this demographic. Other modalities used for treatment but not usually implemented by the VA include stress inoculation training (SIT), exposure therapy using virtual reality (VR), pharmacological approaches (e.g., ketamine and other medications such as Zoloft or Paxil) as well as relaxation and mindfulness tech-

niques (Sharpless & Barber, 2011). However, Sharpless and Barber (2011) noted that given the complexity of PTSD and its associated comorbidities, there is scarce data supporting the use of one specific treatment modality over others or that evidence of a particular intervention is better suited for a specific type of trauma (e.g., sexual assault) or that one treatment is more effective in military populations.

Unquestionably, the choice of a specific approach across the recommended first-line treatments should be based on clinical considerations, clinician expertise in the use and delivery of these core treatment methods, and patient preferences (VA & DOD, 2017). However, while the evidence does support the use of these trauma-focused psychother-

apies for the treatment of PTSD, there are also significant barriers to treatment that continue to exist.

**Barriers to Treatment**

While the VA recognizes and supports conventional psychotherapies as effective first-line treatments, they remain inadequate due to dropout, stigma associated with veterans seeking treatment, and also many veterans retaining a PTSD diagnosis post-treatment (Schottenbauer et al., 2008). For example, a study by Ouimette et al. (2011) examined institutional and stigma-related barriers to care among a large group of Vietnam, Iraq, and Afghanistan veterans who had been diagnosed with PTSD by a VA provider. The results indicated that the most salient barriers to care reported by these veterans were those characterized as stigma-related, specifically discomfort with seeking help and also concerns about social consequences.

In addition, each individual with PTSD symptomology will have a unique rhythm of developing trust, of sharing, and of forging a therapeutic alliance (Shailev et al., 1996). For example, research showed that while evidenced-based therapies provide suitable frameworks through which appropriate care can be received, the therapeutic dissatisfaction remains high with recidivism rates reported as high as 40% in individuals exhibiting significant PTSD symptoms (Sharpless & Barber, 2011). Thus, in response to these recidivism rates and other reasons (e.g., stigma, personal preference, debilitating condition of PTSD), healthcare providers have begun to explore potential complementary or experiential alternatives (Mathersul et al., 2018). One such prolific approach is the therapeutic use of animals, specifically equine assisted therapy (EAT; Lancia, 2008). The phenomenon of EAT has resulted in psychosocial, physical, and emotional changes that may help to serve as a non-pharmacological approach to healing and wellbeing (Selby & Smith-Osborne, 2013).

**Equine Assisted Therapy (EAT)**

EAT is an experiential treatment modality that incorporates equines and equine assisted activities into a treatment plan for the immediate processing of cognitive, behavioral, and sensory functioning, as well as to foster positive growth and learning (Lanning & Krenek, 2013; Selby & Smith-Osborne, 2013). Basically, EAT is designed to promote the development of life skills, emotional regulation and well-being, and improved psychosocial functioning (Lanning & Krenek, 2013). It has the potential to demonstrate that trauma reactions can be managed with less attention on the actual trauma and more emphasis on building connec-
tion, empathic reflection, relational reciprocity, and respect (Cukor et al., 2009; Lancia, 2008). Broadly, incorporating the equine and equine assisted activities into a treatment plan directly contributes to a client’s experiential processes and subsequent gains therein. As Selby and Smith-Osborne (2013) stated, “horses are engaged as change agents to facilitate the process of enhanced biopsychosocial development, growth, and education” (p. 419).

Few research studies have assessed the efficacy of equine assisted interventions (Lanning & Krenek, 2013) as well as therapeutic horsemanship (R. A. Johnson et al., 2018) to address treatment goals aimed at reducing psychological symptoms. Participants of these programs have reported reduced anxiety and depression (Lanning & Krenek, 2013), reduced PTSD (R. A. Johnson et al., 2018), and increased overall wellbeing (Klontz et al., 2007). While revealing some promising trends, the studies have limitations such as variation in methodological approach, no control group, restrictions in data analysis due to small sample size, absence of licensed mental health counselor, and lack of a standardized curriculum.

**Statement of the Research Problem**

PTSD is distinguished by a set of symptomatological markers that have the propensity to manifest days, months, or even years after the witnessing or experiencing of trauma. As such, the chronicity of the disorder has placed excessive demands on society related to treatment costs, productivity losses, and disability compensation (Sharpless & Barber, 2011). Further, there is fear among 60% of veterans that seeking mental health treatment would label them as weak or incapable of leadership (Phillips, 2016). Furthermore, the current standards of care (i.e., pharmacological and exposure or cognitive based therapies) have had varying degrees of success limited by accessibility and reduced outcome results related to early drop out from the programs, resistance, or non-responsiveness to treatment (Sharpless & Barber, 2011). Consequently, the effects of PTSD extend far beyond the healthcare sector and its impact is felt not just by those who experience it, but also by families, peers, employers, and the larger society. As such, “the consequences of PTSD symptoms in veterans and lack of effective treatments, there is an immediate need to investigate other approaches to PTSD management” (Boss et al., 2019, p. 23).

Additionally, it is also an optimal time to correlate with the VA’s current initiative for a paradigm shift in healthcare to leverage solutions regarding holistic care for veterans. As Jonas et al. (2019) noted, “Veterans Health Administration facilities are shifting from a system designed around points of clinical care (in which the primary focus is on disease management) to one that is based in a partnership across time (in which the primary focus is on whole health)” p. 8. Therefore, an integral approach that incorporates not just the biopsychosocial elements but also the spiritual in a treatment intervention plan should be considered to advance to a vision of person-centered healthcare. Outlined below is a brief description of an integral blueprint that provides a holistic approach to person-centered healthcare for the veteran population.

**Integral Blueprint: The Biopsychosocial-Spiritual Model for Holistic Health and Healing**

For the past century, the bio-medical model has dominated health care with its exclusive focus on symptom reduction or preoccupation with the disease and body, neglecting the patient as a person, as a human being (Wade & Halligan, 2004). Subsequently, Engel (1980) introduced the bio-psycho-social model which incorporated the unique characteristics for each of these elements in contrast to taking a reductionistic approach in the scientific bio-medical model. However, it may be prudent to extend Engel’s model further and integrate a spiritual dimension that would stand in contrast to the preoccupation with just gathering neurological, physiological, and social information. Essentially, the integration of the spiritual dimension would allow the inclusion of data on inner experiences (e.g., felt sensations) as well as beliefs and values (e.g., in terms of meaning, faith, hope) thereby embracing a multi-modal, multi-dimensional, integral bio-psycho-social-spiritual blueprint (Figure 1).

Pragmatically, the treatment plan for veterans with PTSD could include components related to spiritual wellbeing as part of overall plan of care and recovery. As B. D. Johnson et al. (2015) noted, “early detection of lowered spiritual well-being may help in preventing comorbid psychiatric disorders” (p. 33). In their study, B. D. Johnson et al. (2015) found that 80% of veterans with PTSD carried a diagnosis of major depression with 83% of them being on anti-depressant medications. Additionally, a study by D. G. Campbell et al. (2007) found that 60% of veterans with PTSD met the criteria for anxiety disorder. Therefore, including the spiritual component to the treatment plan may help to mitigate comorbidity in patients.

Within this spiritual dimension, it would be important to also investigate other factors that may impede the effectiveness of current PTSD treatments such as moral injury (MI; Pearce et al., 2018). MI may be characterized by “a pervasive constellation of inappropriate guilt, shame, anger, self-recrimination and self-handicapping behaviors, and alienation that emerges after witnessing or participating in warzone events that challenge one’s basic sense of humanity” (Currier et al., 2015, p. 62). Essentially, MI can occur not only in psychological symptoms (e.g., shame, guilt, anger) but also in spiritual symptoms (e.g., loss of meaning/purpose, moral concerns, and forgiveness; Koenig et al., 2018).

Further, MI can also be a barrier to reducing PTSD symptoms as it may be positively correlated with PTSD among veterans (Currier et al., 2015; Pearce et al., 2018). For instance, in a recent study with 427 military service members, nearly 90% indicated high levels of at least one symptom of MI...
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(rated 9 or 10 in severity on a scale of 1 to 10), and more than 50% reporting high levels for five or more symptoms (Koenig et al., 2018). Broadly, MI was strongly correlated with PTSD symptoms, anxiety, and depression, as well as with physical disability, chronic pain, relationship problems, and social withdrawal.

Furthermore, while MI may be intimately connected to spiritual beliefs and values, other elements (e.g., shame or guilt) are typically not addressed in secular approaches (Pearce et al., 2018). As Pearce et al. (2018) explained, “secular approaches focus on thinking errors, dysfunctional cognitions, erroneous underlying assumptions, and rational justifications, not on spiritual resources, spiritual struggles, and the spiritual ramifications of trauma and their interconnections with symptoms of PTSD” (p. 2).

Thus, the inclusion of spiritually integrated treatment elements such as contemplation, mindfulness, or mantram (sacred word) meditation could target not just MI, but also help those who are disempowered and feel alienated by trauma, nurture their inner capacities to recognize the nature and meaning of their experiences (Pearce et al., 2018).

Additionally, given the hyper-focus on self that results from so much physical symptomology, strategies that encourage self-transcendence (ST), which is the capacity to expand personal boundaries to connect to self (intrapersonal), others (interpersonal), and beyond (transpersonal), culminating together in the human ability to create meaning, should also be considered a central core aspect of the spiritual dimension (Levenson et al., 2005).

Primarily, self-transcendence is hypothesized to be a dynamic process in the stages of wisdom development and may also be considered a major contributor to the changes in physiological and psychological states experienced by those

Figure 1: An Integral Blueprint: The Bio-Psycho-Social-Spiritual Model.

Note: The model depicts the different inter-lapping components of Engel’s (1980) bio-psycho-social model with the added spiritual component.
dealing with stress or trauma or loss (Levenson et al., 2005). Particularly, self-reflective activities, such as meditation practices, may be positively related to self-transcendence and this could have a significant relationship to positive health outcomes (Levenson et al., 2005). As Engelman (2019) added, the inclusion of a spiritual component could result in the surfacing of a transcendent movement within, leading towards a more integrated sense of self, highlighting aspects of posttraumatic growth. Therefore, incorporating these elements of spiritual wellbeing, such as contemplation or mindfulness or yoga, to address the depression or anxiety or stress for veterans with PTSD, would be valuable.

Additionally, from the perspective of the human-animal relationship, animal assisted interventions are effective when "integrating bio-psycho-social-spiritual aspects of wellbeing through a spiritual model of change” (Engelman, 2019, p. 73). Thus, integrating the elements of spirituality such as a mindfulness practice in the treatment plan could help address trauma and suffering in compassionate ways. While the empirical literature on spirituality or spiritual wellbeing among military personnel is scarce, there is evidence emerging that indicates veterans draw on spiritual resources in difficult times (Benda et al., 2006; Currier et al., 2018; Pearce et al., 2018).

In conclusion, a shift to holistic health would seek to implement behavioral and complementary approaches to healthcare and would be in keeping with the change currently being implemented in the overall military doctrine and systems run by the Department of Defense (DoD) and the Veterans Health Administration (VHA) that is expected to be fully implemented by the end of 2022 (Jonas et al., 2019).

Methods
Research Design
The study utilized a quasi-experimental nonrandomized control group design (D. T. Campbell & Stanley, 1963; Creswell & Creswell, 2018) sometimes referred to as a non-randomized control group pretest-posttest design (Levy & Ellis, 2011). For this research study, the independent variable is EAT intervention or mindfulness or yoga, to address the depression or anxiety or stress for veterans with PTSD, would be valuable.

The dependent variables are PTSD, as measured by the PTSD Checklist—Military Version (PCL-M), and wellbeing, as measured by The Functional Assessment of Chronic Illness Therapy—Spiritual Well-Being Scale (FACIT-Sp).

Participants
A purposive sampling was used to focus on participants (i.e., veterans with PTSD) to assist with the study (Palinkas et al., 2015). The recruitment was through referrals from the local VA, veteran clinics, and other organizations that support veterans. Additionally, word-of-mouth and the snowball technique was also implemented. A total sample of 50 veterans were recruited and assigned to two groups, 25 for intervention and 25 for control (Figure 2). The intervention group included three cohorts with 8–10 veterans meeting on three separate mornings each week. The waitlist control group participants continued with treatment as usual (i.e., with cognitive or exposure therapies through the VA or their care provider) with the option to receive EAT at the next session.

Sample Size Determination
The total of 50 participants for this study was computed using the recommended minimum power of 0.80 (a beta value [β] or Type II error rate), an alpha value of 0.025 (Type I error rate) with an estimated effect size of r = 0.90, which was set based on Cohen’s (1988) commonly used effect size in psychological research (Lakens, 2013). Additionally, the alpha value was adjusted from 0.05 to 0.025 after applying the Bonferroni Correction since two outcome measures were used for this study. This helps to reduce the chances of obtaining false-positive results (Type I errors) when multiple tests are performed on a single set of data (Field, 2018).

Inclusion/Exclusion Criteria
Inclusion criteria was 18 years or older, open to all ethnicities, able to participate in English and provide consent, a diagnosis of PTSD, able to walk at least 25 feet unassisted, and weigh 250 pounds or less. This weight limit, as determined by equine specialist, was because the equines could not accommodate heavier participants. Exclusion criteria was participants below 18 years, unable to provide consent, no diagnosis of PTSD, pregnant women, and individuals with a weight greater than 250 pounds.

Instrumentation
Demographics
A demographic and service information sheet requested data related to the veteran’s gender, age, ethnicity, military branch, combat operation, deployment location, rank/time since separation, years of service, and history of mental health.

PTSD Checklist—Military Version (PCL-M)
The PCL-M (Weathers et al., 1993; VA, 2018c), a 17-item self-report measure of PTSD symptoms, enquires about difficulties in response to traumatic or stressful military experiences. For example, in response to the stressful military experiences, participants are asked to rate how much they were distressed by the problem in the last month. Items are rated on a 5-point Likert scale ranging from 1 (not at all) to 5 (extremely). A total symptom severity score (range = 17 to 85) is obtained by summing the scores of the 17-items with a recommended score of 50 as indicative of a PTSD diagnosis (Weathers et al., 1999; National Center of PTSD, 2018). Further, previous research has found the PCL-M has strong internal consistency (0.94–0.97), test-retest reliability (0.97 over 3 days), concurrent validity (0.77–0.93), and diagnostic efficiency with a sensitivity of 0.82 and specificity of 0.84 (Weathers et al., 1999). Furthermore, the scale has also demonstrated strong psychometric properties and is used frequently in research studies for monitoring symptom change (Bovin et al., 2015).
**Functional Assessment of Chronic Illness Therapy—Spiritual Well-Being Scale (FACIT-Sp)**

The FACIT-Sp (Peterman et al., 2002), a 12-item self-report questionnaire is part of the larger FACIT measurement system that assesses multidimensional health related quality of life (HRQL). As Peterman et al. (2002) noted the FACIT-Sp is “an instrument that was designed to provide an inclusive measure of spirituality that could be employed in research with people with chronic and/or life-threatening illnesses” (p. 50). This measure uses a 5-point Likert-type scale to measure HRQL (0 = not at all true to 4 = very much true) and the recall period for each question is 7 days with overall scores ranging from 0 (low) to 48 (high). Also, the scale demonstrates good internal consistency, reliability, and has a significant relation with quality of life. In addition, a study by Bormann et al. (2012) of veterans' with military-related PTSD using FACIT-Sp, the Cronbach’s alpha was 0.94. Thus, the FACIT-Sp is considered a psychometrically good measure of spiritual wellbeing for use in the general population, within chronic illness populations, or both.

**Data Collection**

At Week 1 the informed consent was first obtained prior to data collection of baseline assessments. All veterans identities remained confidential (e.g., use of a number code was applied) and data collected was safely secured at the researcher’s office. Further, for participants in the control group, the data was handled in the same confidential manner and informed consent was also obtained prior to data collection. All posttest data were collected at Week 10, post-intervention.

**Statistical Analysis**

All data were analyzed using IBM Statistical Package for the Social Sciences (SPSS, Version 26.0; https://www.ibm.com). Paired samples t-test was conducted to examine differences between pre-intervention and post-intervention scores. Additionally, a repeated-measures analysis of covariance (ANCOVA) was also conducted to determine whether there were any significant differences between two or more independent groups on a dependent variable (Dimitrov & Rumrill, 2003; Kim & Willson, 2010). The dependent variable was the posttest score and the pretest score was not an outcome, but a covariate (Dimitrov & Rumrill, 2003; Kim & Willson, 2010). Using the ANCOVA method helps to eliminate systematic bias and reduce error variance (Dimitrov & Rumrill, 2003), as well as to statistically control for a third variable, sometimes known as the confounding variable (Field, 2016).

**The Intervention: Equine Assisted Therapy**

The intervention conducted at McCormick Research Institute (McCormick, 2019) is a premier center accredited by the Professional Association of Therapeutic Horsemanship International (PATH Intl.). The curriculum incorporates 10-weekly, 3-hour EAT sessions together with a combination of groundwork and mounted equine assisted activities (e.g., grooming, tacking, riding) as well as personal and group reflection activities. A licensed mental health counselor (LMHC), a PATH Intl. certified equine specialist in mental health and learning (ESMHL), and riding instructors participated in every session.

Broadly, the curriculum integrated themed lesson plans with weekly goals and equine assisted activities. For example, one of the weekly themes was focused on communication: its relationship to the use of tone (passive-aggressive-assertive) and its impact on mood states (anger, guilt, fear) or behavior (avoidance or numbing). Integrated into the session is the equine activity, Rotating Appendages, where participants lock arms as a unit and rotate roles to halter/saddle the equine. The intent is on awareness of emotions when there is disagreement (such as different points of view), recognizing and respecting discomfort, and communicating in uncomfortable situations. The session ends with a closing circle of counselors, equine instructors, and veterans, synthesizing experiences and clarifying translation of cognitive processes and coping skills (Table 1).

Further, prior EAT programs at McCormick have included veterans with diverse ethnicities and cultural backgrounds and this has helped all staff involved in the EAT sessions to work with respect and cultural sensitivity. Consequently, the low attrition rate of 12% for the program from prior research (Monroe et al., 2018) is indicative that race/ethnicity was not a barrier to treatment engagement and session attendance. More importantly, the self-report measures chosen (e.g., VA recommended PCL-M) are designed to be assessed in diverse populations, and to determine impact on PTSD regardless of gender or race/ethnicity of the veteran. Essentially, the racial and ethnic composition of veterans were not related to outcomes.

**Treatment Fidelity**

For this research study, a LMHC with over 25 years’ experience in private practice including 5+ years’ working with the EAT curriculum was responsible for the delivery of treatment. In addition, a PATH-certified ESMHL with over 15 years’ experience including 8+ years’ also working with EAT curriculum, partnered with the LMHC for the equine assisted activities. Together, they held weekly meetings where session outlines were reviewed prior to delivery of the program (Table 1).

Further, the EAT program was provided in a co-ed group format and adhered to a cognitive-behavioral framework. Furthermore, to ensure participant receipt and understanding of protocol, weekly handouts related to each session’s theme were provided to assess their ability to perform program-related activities. In other words, the degree to which the veteran demonstrated that they understood and could perform the behavioral skills (e.g., relaxation techniques, grooming the horse) or cognitive strategies (e.g., reframing, problem-solving) that were presented to them, was integral to the design and fidelity of the EAT curriculum. This level of detail highlighted the rigor with which the treatment was.
Table 1: McCormick Research Institute Equine Assisted Therapy Curriculum Overview©.

| Week | Description | Session Overview |
|------|-------------|------------------|
| 1    | Welcome; introductions; confidentiality; group rules; overview of program; safety. | **Equine Assisted Activities (EAA)**: Theme: **Trauma Intelligence** - understanding PTSD – arousal, avoidance; triggers; awareness – feelings/thoughts/emotions (Handout: Body Language). **Focus**: Building confidence/communication skills; (Handout: Parts of Horse); Activity: Choose or Be Chosen (horse behavior [fight or flight response]; body language; herd dynamics; leading/grooming; nonverbal communication) **Wrap-up**: Self-reflection: overcoming challenges; building confidence; adapting; Q&A. |
| 2    | Welcome; Introduce present moment experience. | **EAA**: Theme: **Awareness of Feelings** (Handouts: Myths/Symptoms of PTSD; Awareness Wheel; Emotional Regulation); hyperarousal; self-regulation of emotions/feelings to a place of rest/calm for endurance/survival. **Focus**: Continue building connection/trust; Activities: Grooming with Intention; Around the World (incongruity of intention versus behavior); group work. **Wrap-up**: Self-reflection: awareness; nonjudgmental; teambuilding; reframing; Q&A. |
| 3    | Welcome; Review: feelings; introduce “Around Me” + “Actions” (thoughts/behavior) | Theme: **Triggers** (Handout: Triggers); response/reaction to triggers; review emotional regulation; practice being present, fully attentive, focused on task at hand. **Focus**: Building confidence/assertive communication; Activities: Grooming with Intention (continue building connection, trust); Activity demo for triggers: demonstrate desensitization; tack-up/riding (bonding with horse). **Wrap-up**: Self-reflection: empowerment; healthy ways of coping with triggers; importance of grounding: mental/emotional states; present moment awareness; Q&A. |
| 4    | Welcome; Review from previous weeks: Awareness Wheel and Triggers (handouts). | Theme: **Problem Solving** (Handout: A+B=C (Antecedent, Behavior, Consequences); exploring habits; (Handouts: Stress Cycle and Setting Goals); problem solving (working through resistance and fear). **Focus**: Problem-solving (Handout: Colors of Horses); demonstration on saddling; Activities: Saddling/Leading horse over tarp with obstacles (associations to triggering stimuli; flooding of emotions; reframe/replace emotions); Riding (how to stop, turn, ride forward). **Wrap-up**: Self-reflection: problem-solving; addressing fears; analyze maladaptive behaviors (Handout: Relaxed Breathing Techniques); learn/practice diaphragmatic breathing; Q&A. |
| 5    | Welcome; Review feelings: Awareness Wheel; stress cycle (old versus new behavior); setting goals. | Theme: **Regulating Your Energy** – positive energy/emotional fuel to accomplish goals; negative energy can derail goals; Review: Body Language i.e., how we communicate nonverbally/with words; (Handout: Passive-Assertive-Aggressive). **Focus**: Energy: passive-aggressive-assertive; (Handout: Lunging); walk-trot-canter; safety related to lunging/kick zone; Activity: Lunging a Horse. **Wrap-up**: Self-reflection: communication style (energy); reflect on energy style; what needs to change (commitment); Handout: Communication; Q&A. |
| 6    | Welcome; Awareness Wheel; Communication style: passive/active/declarative. | Theme: **Telling your story – Poor Choices vs. Healthy Choices** Poor choices: avoiding/numbing/suppression/reactionary. Healthy choices: action oriented versus reactionary; avoidance eliminates processing traumatic event/feelings. **Focus**: Desensitization; Art Activity: Telling your Story; (Handouts: Symbols of Indians and Horse Markings). **Wrap-up**: Self-reflection: storytelling/symbolic communications; recognize the transcending of trauma memories using art; Q&A. |
| 7    | Welcome; Communication: interaction of triggers, beliefs, and feelings; impact on (irrational) thinking styles. | Theme: **Communication/Actions** (review story from last week) Communication: use of tone (passive-aggressive-assertive); energy (positive or negative); Goal of good communication: keep space safe, be heard & hear other (way to connect, to feel heard/cared about, bonding). Actions: awareness of thoughts/unresolved issues; emotional intensity (reactionary vs action-oriented). **Focus**: Communication: listening; teamwork; Activity: Rotating Appendages (teamwork rotations to halter/saddle the horse). **Wrap-up**: Self-reflection: equine activity: being in different roles? preference? (Handouts: I-Messages/Imago Dialogue; Reflective Listening); Q&A. |
administered, and this further enables comparability and replicability across studies (Barber et al., 2007).

Ethics
The veterans were given complete information regarding purpose of study prior to participation in the research via informed consent. Further, there was no conflict of interest in objectively presenting the findings to determine effectiveness of the EAT program. Furthermore, to ensure the protection of human subjects, this research study was approved by the Institutional Review Board (IRB) of Sofia University. In addition, equine specialists at McCormick who directly supervise the medical and mental health standards of the equines are credentialed, licensed, and registered with PATH Intl. ensuring that the welfare and management of each equine under the care of the institute is in accordance with the highest industry standards.

Results

Safety and Acceptability of the EAT Program
All participants in the intervention group attended and safely completed the 10-week, 3-hour weekly equine assisted activities and therapy sessions at the McCormick facility. No adverse events or injuries were reported.

Baseline Characteristics: Demographic and Mental Health (Table 2)
Demographic variables which were nominal or categorical such as gender, ethnicity, branch of military service, combat operation, service rank at separation, and mental health characteristics, were reported by frequency statistics to display the number of participants per category and associated percentages. The equal interval data such as age, years of service, and time since separation, were reported by descriptive statistics that display central tendency (mean) and measures of variability or spread.

The demographic data analyses revealed veterans across military ranks and who served in all combat eras with a majority enlisted in the Army, participated in the program. Further, the age range was from 31–72 years with the median age at 49 years, and on average the veterans completed seven years of service. Furthermore, veterans who had separated from military service (approximately 13 median years since separation) were still struggling with PTSD symptoms.

With regard to history of mental health, the findings revealed 54% having mental health disorders with 40% reporting a specific type of disorder (e.g., mood disorder being the highest at 34%). Also, with regard to traumatic brain injury (TBI) and other concussion symptoms distribution, 38% reported yes to having TBI or concussion symptoms after deployment and 62% reported no to having any TBI or other concussion symptoms after deployment.

Paired Samples t-test for PCL-M
For the veterans in the intervention group, the results from the paired samples statistics indicated that PCL-M mean scores (with standard deviation in parenthesis; Table 2) at pretest was 63.43 (12.18) and at posttest was 48.57 (15.97). For the veterans in the control group, the PCL-M scores at pretest was 63.43 (12.18) and at posttest was 48.57 (15.97). The mean score changes is graphically displayed in Figure 3.

Next, paired samples test for the intervention group showed that posttest mean scores elicited a decrease of 14.86 compared to the pretest scores. The t-test statistic
Table 2: Results from Baseline Characteristics and Paired Sample Statistics.

| Descriptive Statistical Analysis | Mean (Std. Deviation) |
|----------------------------------|-----------------------|
| Age                              | 48.7 (12.0)           |
| Time Since Separation (Years)    | 16.1 (12.5)           |
| Years of Service                 | 11.7 (9.7)            |

| Frequency Statistical Analysis   | Number (%)            |
|----------------------------------|-----------------------|
| Gender                           |                       |
| Male                             | 37 (74%)              |
| Female                           | 13 (26%)              |
| Race                             |                       |
| Hispanic                         | 23 (46%)              |
| White or Caucasian               | 19 (38%)              |
| Black or African American        | 8 (16%)               |
| Military Branch                  |                       |
| Army                             | 31 (62%)              |
| Navy                             | 10 (20%)              |
| Marine                           | 4 (8%)                |
| Air Force                        | 3 (6%)                |
| Mixed Military Branches          | 2 (4%)                |
| Military Rank at Separation      |                       |
| Non-Commissioned Officer–NCO    | 24 (48%)              |
| Junior Enlisted                  | 11 (22%)              |
| Senior NCO                       | 8 (16%)               |
| Junior Officer                   | 4 (8%)                |
| Senior/Chief Warrant Officer     | 2 (4%)                |
| Other                            | 1 (2%)                |
| History of Mental Health (Comorbid Disorders) |       |
| Yes (Various)                    | 27 (54%)              |
| Mood Disorder                    | 17 (34%)              |
| No                               | 3 (6%)                |
| Obsessive-Compulsive             | 1 (2%)                |
| Generalized Anxiety Disorder     | 1 (2%)                |
| Schizophrenia                    | 1 (2%)                |
| TBI or Other Concussion Symptoms |                       |
| No                               | 31 (62%)              |
| Yes                              | 19 (38%)              |

Results of Paired Samples Statistics: PCL-M & FACIT-Sp

| Results of Paired Samples Statistics: PCL-M & FACIT-Sp | Mean (Std. Deviation) |
|--------------------------------------------------------|-----------------------|
| For PCL-M:                                             |                       |
| Intervention Group                                     | 63.43 (12.18)         |
| Control Group                                          | 59.56 (11.08)         |
| For FACIT-Sp:                                          |                       |
| Intervention Group                                     | 21.57 (8.02)          |
| Control Group                                          | 25.00 (9.61)          |
obtained was statistically significant at the specified \( p \)-value < 0.025 level, \( t(20) = 4.27, SEM = 3.48, p < .001, 97.5\% CI [6.42, 23.29] \). For the control group, the posttest mean scores elicited a decrease of 6.52 compared to the pretest scores. The \( t \)-test statistic obtained was statistically significant at the specified \( p \)-value < 0.025 level, \( t(24) = 3.00, SEM = 2.17, p < .025, 97.5\% CI [1.33, 11.71] \). These findings for the paired samples test are displayed in Table 3.

**Paired Samples \( t \)-test for FACIT-Sp**

For the veterans in the intervention group, the results from the paired samples statistics showed that FACIT-Sp mean scores (with standard deviation in parenthesis; Table 2) at pretest was 21.57 (8.02) and at posttest was 31.52 (9.74). For the veterans in the control group, the FACIT-Sp scores at pretest was 25.00 (9.61) and at posttest was 32.32 (9.49). In the final analysis, veterans in both groups significantly affected their quality of life and wellbeing scores.

The paired samples test for the intervention group showed that posttest mean scores elicited an increase of 9.95 compared to pretest scores. The \( t \)-test statistic obtained was statistically significant at the specified \( p \)-value < 0.025 level, \( t(20) = –4.91, SEM = 2.03, p < .001, 97.5\% CI [–14.86, –5.04] \). For the control group, the paired samples test showed the posttest mean scores elicited an increase of 7.32 compared to pretest scores. The \( t \)-test statistic obtained was also statistically significant at the specified \( p \)-value < 0.025 level, \( t(24) = –4.96, SEM = 1.48, p < .001, 97.5\% CI = [–10.85, –3.79] \).

**Analysis for Covariance (ANCOVA)**

The ANCOVA model is used to determine whether there are any significant differences between two or more independent groups on a dependent variable (Dimitrov & Rumrill, 2003). Essentially, the dependent variable is the posttest score and pretest score is not an outcome, but a covariate. The purpose of using pretest scores as a covariate is...
to reduce the error variance and eliminate systematic bias (Dimitrov & Rumrill, 2003). Also, the model is predicated on the following assumptions: the independent variable and the covariate are independent of each other; the dependent variable and covariate are both continuous; the pretest and posttest scores are normally distributed for each level of the treatment; there is homogeneity of variances and of regression slopes (Dimitrov & Rumrill, 2003; Field, 2016). These assumptions were evaluated and was found to be within acceptable parameters for analysis.

**ANCOVA Results for PCL-M**

The PCL-M mean values was adjusted by the covariate (i.e., pretest scores) to show the adjusted means output. This is important because the statistical significance of the two-way interaction effect is based on this adjusted means value and not the unadjusted means (Clason & Mundfrom, 2012). Therefore, the results with 97.5% confidence interval of the adjusted mean for the dependent variable (i.e., PCL-M posttest scores) for the intervention group was 47.18 ± 2.86 (adjusted mean ± standard error) and for control group 54.21 ± 2.61. Further, the covariate (i.e., PCL-M pretest score) was evaluated at a value = 61.33.

Next, a one-way ANCOVA was conducted to compare the effectiveness of EAT on PTSD while controlling for pretest PCL-M scores. Levene's test and normality checks were made and the assumptions met. There was no significant difference in mean changes on the PCL-M, $F(1, 43) = 3.255, p = 0.078$, partial $\eta^2 = 0.070$, which suggests a medium-small effect size.

**Figure 3**: Change in PTSD Symptom Scores Pretest-Posttest.

*Note:* The posttest scores significantly reduced by almost 15-points for the EAT completers when compared to control group where posttest scores decreased by only 7-points.

**Table 3**: PCL-M Paired Samples Test – Intervention and Control Groups.

| Paired Differences | Mean  | Std. Deviation | Std. Error Mean | 97.5% Confidence Interval of the Difference | t   | df  | Sig. (2-tailed) |
|--------------------|-------|----------------|-----------------|--------------------------------------------|-----|-----|----------------|
| Intervention Group | Pretest – Posttest | 14.857 | 15.951 | 3.481 | 6.423 | 23.291 | 4.268 | 20 | .000* |
| Control Group      | Pretest – Posttest | 6.520  | 10.859 | 2.172 | 1.327 | 11.713 | 3.002 | 24 | .006* |

*Note:* $t$ = the $t$-test statistic; $df$ = degrees of freedom; Sig. = Significance level / $p$-value; * $p < .025$. 
ANCOVA Results for FACIT-Sp
Similar to the PCL-M measure, the FACIT-Sp results for the intervention group was 32.73 ± 1.71 (adjusted mean standard error) and for control group, the output was 31.31 ± 1.57. Further, the covariate (i.e., the FACIT-Sp pretest score) was evaluated at a value = 23.43.

Next, a one-way ANCOVA was conducted to compare the effectiveness of EAT on overall quality of life and wellbeing while controlling for pretest FACIT-Sp scores. Levene's test and normality checks were made and the assumptions met. There was no significant difference in mean changes on the FACIT-Sp, $F(1, 43) = 0.368, p = 0.547$, partial $\eta^2 = 0.008$, which suggests a very small effect size.

Discussion
Demographic and Mental Health
Participants were military veterans who served in the Gulf War, OIF, OEF, Somalia, and Vietnam. But a majority of them, both male and female, were enlisted in the Army and served in the Iraq and Afghanistan conflicts. Further, veterans across military ranks from junior enlisted to commissioned officers participated in the EAT program. Furthermore, there was a wide range in ages of veterans who participated in the program (from 31–72 years) with the median age at 49 years.

With regard to ethnic diversity, while almost half of the veterans in the program were Hispanic, other ethnicities who participated were Caucasian and African American. As such, there was no selection bias with regard to inclusion of veterans of all eras, age, rank, or ethnicity. Also, one of the veteran participants used a walker for assistance, and to ensure full and complete participation in the program, an additional wrangler was assigned each week to help the veteran with the equine-assisted activities as well as to ensure safety.

A key finding in the demographic data analyses was that veterans who had separated from military service (approximately 13 median years since separation) were still struggling with PTSD symptoms. This finding is consistent with literature that reported PTSD symptom severity has remained within the veteran population many years after initial onset (Sharpless & Barber, 2011). Additionally, 38% also reported "yes" to having traumatic brain injury (TBI) and other concussion symptoms. While this finding is also consistent with literature on TBI being the "signature injury" of the Iraq and Afghanistan wars, it is significant because many of the symptoms associated with mild TBI such as anxiety, insomnia, memory problems, irritability, and emotional numbing, can also occur with PTSD (Bryant, 2011; Carlson et al., 2011; Rona, 2012). The key point is that the overlap of symptoms between TBI and PTSD, further complicates diagnosis and treatment planning.

Changes in Posttraumatic Stress Symptoms: Pre-post treatment comparison
Veterans in both groups were evaluated across two time points, Week 1 (pretest) and Week 10 (posttest) using the PCL-M to determine changes in PTSD symptom severity. Paired samples t-test was conducted to examine changes in mean scores from pre- to post-treatment for all EAT completers, for participants in the control group, and for the total number of veteran participants.

Within-Subjects Analyses
The output from paired samples statistics for the intervention group showed there was a significant decline in PCL-M posttest mean scores by almost 15 points (Table 3). This decrease in PTSD symptom severity scores represented clinically meaningful improvements (National Center of PTSD, 2018). Notably, the fact that some of our veterans in the program served in the Vietnam war era, perhaps living with PTSD for decades yet derived a clinically meaningful improvement from a 10-week EAT intervention, is promising. Further, the results were also similar to published PTSD change scores (i.e., greater than 10-points) across comparable research studies indicating clinically meaningful improvements using EAT intervention for veterans with PTSD (R. A. Johnson et al., 2018; Romaniuk et al., 2018).

The findings from paired samples statistics for the control group showed a 7-point reduction in mean scores for the PCL-M measure at posttest (Table 3). This decrease is considered a reliable improvement (National Center of PTSD, 2018). Basically, while there was a decrease in PTSD symptom severity scores at posttest for control group, the change in scores were not as high when compared to the EAT completers (Figure 3). Essentially, for the PCL-M measure that ranges between 17–85, the significant change of approximately 15 points for the intervention group was about 18% difference when compared to the control group that showed about 8% difference.

One potential reason for the significant reduction in PTSD symptom scores for the EAT completers could be the inclusion of a group component which fosters social connection, facilitates building trust, diminishes mental health stigma, maximizes therapeutic outcome, and increases generalizability of skill acquisition (Schnurr et al., 2003; Sloan & Beck, 2016; Sloan et al., 2012). While there is no formal endorsement of group therapy for treatment of PTSD, nevertheless, this treatment format is frequently used in healthcare settings (Hunt & Rosenheck, 2011; Schnurr et al., 2003; Sloan et al., 2012).

For the control group, one possible reason for reduction in PTSD symptom scores was that some of the veterans were recruited from an organization that works primarily with breeding and training dogs for placement in homes of veterans and first responders. While no animal assisted therapy was provided, research has shown that the use of service-dogs (in general) has been acknowledged to also aid veterans in stress or anxiety reduction (Yount et al., 2013; Berget et al., 2008).

Between-Subject Analyses
The output analysis for the paired samples t-test for both groups was statistically significant (where $p < 0.025$; Table 3) with effect size $d = 0.6$, which is considered medium-large (Cohen, 1988). However, ANCOVA analysis of the interaction between-subjects effects for the PCL-M showed that there
was no statistical significance \( (p > 0.025) \). In addition, the achieved statistical power \((1 - \beta) = 0.5\) and the effect size \(= 0.3\) was considered small-medium, as determined by Cohen (1988). But, it should be noted that to reach power \((1 - \beta) = 0.80\) with a medium to large effect size \((d = 0.6)\) and alpha value \((\alpha = 0.025)\), a total sample size of \(N = 106\) (i.e., 53 participants in each group per G\(^2\)Power 3.1.9.4 calculations) would be needed, which is double the number of participants recruited for this study. Additionally, as the EAT program was offered free of charge, the high costs (i.e., \$3750 per veteran) capped the limit to 25 participants.

**Changes in Spiritual Well-Being: Pretest-Posttest Comparison**

The FACIT-Sp scale was used to measure change beyond just the severity of the symptoms and examine how the veterans perceived and experienced the constructs of meaning, peace, and faith in their daily lives. The ANCOVA results of the interaction between-subjects effects showed no statistical significance \( (p > 0.025) \) with statistical power \((1 - \beta) = 0.615\) and effect size \(= .09\). However, the paired samples t-test showed statistically significant results for both groups, i.e., change in mean scores from pre- to post-test increased by almost 10 points for the EAT completers and by 7 points for veterans in the control group. Essentially, for the FACIT-Sp measure that ranges between 0–48, the change of approximately 10 points for the intervention group showed about 21% difference when compared to the control group that was about 15% difference.

In general, while the spiritual wellbeing scores were significant it is possible that these scores may also be associated with the acceptance of an “illness” which in turn could impact better recovery outcomes (Peterman et al., 2002). For example, some of the veterans in the intervention group have been living with the PTSD symptoms for decades, some since the Vietnam era. Thus, the change from pretest to posttest scores for some of the veterans is evidence that increased wellbeing may be associated with the ‘acceptance’ of an illness (such as PTSD in this study).

**Limitations of the Research Study**

Some limitations were: (a) generalizability to all veterans is less probable as it was not a randomized controlled trial (RCT); (b) the small sample size limited the power of the study; (c) no longitudinal assessment for EAT completers to determine whether PTSD symptom scores remained low after a lapse of time; (d) PTSD symptom change was measured using the PCL-M assessment, a self-report measure rather than the clinician-administered PTSD scale (CAPS), which is considered the gold-standard; (e) participation by individuals in the control group in ongoing “treatment as usual” may have obscured the potential benefit of EAT findings in the intervention group; (f) while a key strategy to limit bias was the inclusion of a wait-list control group, however, participants in intervention group were not blinded to nature and type of treatment intervention; and (g) no treatment fidelity rating system where objective rater(s) rate random treatment sessions for adherence and competence.

Finally, the EAT protocol used a multi-component approach with the integration of cognitive, emotional, and behavioral aspects in therapy as well as the outdoor arena for the equine assisted activities. Thus, the study did not evaluate the degree to which changes over time were due to specific treatment components versus non-specific treatment components related to therapeutic alliance or being outdoors. The fact that an individual’s behavior may
be influenced by interaction with the environment, known as “reciprocal determinism” (Bandura, 1978, p. 344), which is a common psychological and behavioral concept, it may be important in future research studies to account for this bidirectional relationship and its impact on behavior of the participant.

**Future Directions**

Future research should assess the efficacy of EAT and outcomes in a RCT including comparison to evidence-based first-line treatments such as cognitive or exposure therapies. Further, while a formalized 10-week EAT protocol was used to investigate treatment efficacy, future studies should also examine the optimal length (e.g., expansion from 10 to 12 weeks). Conversely, exploring whether an intense full-day 1-week long program versus the 10-week or 30 hours currently offered, would be beneficial. Additionally, changes in many important domains of functional impairment could be examined like emotional regulation, resilience, and self-transcendence.

Furthermore, a larger sample size and in partnership with the local VA should be explored. A partnership would allow the VA medical system to not only examine the impact of expanding delivery of PTSD treatments to other private civilian settings, but it could also enable flow of information to veterans on alternative treatment options as they transition from the military to the VA medical system.

**Conclusion**

Overall, no conclusion regarding efficacy of EAT can be made as there was no statistical significance achieved using the ANCOVA model. However, results from the paired samples t-test revealed clinically meaningful PTSD change scores at posttest for EAT completers, which is significant especially given the long history of trauma symptoms for some of the veterans. These results may be a useful lens to examine the benefits of using the EAT protocol in reducing PTSD symptoms for such a demographic. Additionally, given that PTSD is one of the most debilitating disorders affecting military servicemembers and is a precipitating risk factor for suicide (Gradus, 2017), it is imperative for a paradigm shift in healthcare to leverage solutions for healing the whole person. Therefore, future research studies with a larger open trial, larger sample size, and integrating the multi-modal, multi-dimensional, bio-psycho-social-spiritual model into the EAT intervention, could leverage significant outcomes of holistic health and wellbeing for veterans with PTSD symptomology.

**Equine Assisted Therapy – Consensus Around Terminology**

PATH Intl. is currently “leading an initiative with the goal of term definition consensus among the major stakeholders in the field of equine-assisted activities and therapies” (PATH Intl., 2020, para. 1) and an announcement regarding this effort is expected in 2020.

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**Competing Interests**

The author has no competing interests to declare.

**References**

American Psychiatric Association. (1980). Diagnostic and statistical manual of mental disorders (3rd ed.).

American Psychiatric Association. (2013). Trauma- and stressor-related disorders. In Diagnostic and Statistical Manual of Mental Disorders (5th ed., pp. 265–290). DOI: https://doi.org/10.1176/appi.books.9780890425596.dsm07

Bagalman, E. (2013). Mental disorders among OEF/OIF veterans using VA health care: Facts and figures. https://fas.org/sgp/crs/misc/R41921.pdf

Bandura, A. (1978). The self-system in reciprocal determinism. American Psychologist, 33(4), 344–358. https://www.uky.edu/~eushe2/Bandura/Bandura1978AP.pdf DOI: https://doi.org/10.1037/0003-066X.33.4.344

Barber, J. P., Triffleman, E., & Marmar, C. (2007). Considerations in treatment integrity: Implications and recommendations for PTSD research. Journal of Traumatic Stress, 20(5), 793–805. DOI: https://doi.org/10.1002/jts.20295

Bellg, A. J., Borrelli, B., Resnick, B., Hecht, J., Minicucci, D. S., Ory, M., Ogedegbe, G., Orwig, D., Ernst, D., & Czajkowski, S. (2004). Enhancing treatment fidelity in health behavior change studies: Best practices and recommendations from the NIH behavior change consortium. Health Psychology, 23(5), 443–451. DOI: https://doi.org/10.1037/0278-6133.23.5.443

Benda, B. B., DiBlasio, F. A., & Pope, S. K. (2006). Spiritual well-being, relationships, and work satisfaction in the treatment of homeless veterans with alcohol/other drug problems. Alcoholism Treatment Quarterly, 24, 109–124. DOI: https://doi.org/10.1300/J020v24n01_07

Berget, B., Ekeberg, O., & Braastad, B. O. (2008). Animal-assisted therapy with farm animals for persons with psychiatric disorders: Effects on self-efficacy,
coping ability and quality of life, a randomized controlled trial. Clinical Practice and Epidemiology in Mental Health, 4(9), 1–7. DOI: https://doi.org/10.1186/1745-0179-4-9

Bormann, J. E., Liu, L., & Thorp, S. R. (2012). Spiritual well-being mediates PTSD change in veterans with military-related PTSD. International Journal of Behavioral Medicine, 19, 496–502. DOI: https://doi.org/10.1007/s12529-011-9186-1

Boss, L., Branson, S., Hagan, H., & Krause-Parello, C. (2019). A systematic review of equine-assisted interventions in military veterans diagnosed with PTSD. Journal of Veteran Studies, 5(1), 23–33. DOI: https://doi.org/10.21061/jvs.v5i1.134

Bovin, M. J., Marx, B. P., Weathers, F. W., Gallagher, M. W., Rodriguez, P., Schnurr, P. P., & Keane, T. M. (2015). Psychometric properties of the PTSD checklist for Diagnostic and Statistical Manual of Mental Disorders–Fifth Edition (PCL-5) in veterans. Psychological Assessment, 1–13. DOI: https://doi.org/10.1037/pas0000254

Bryant, R. (2011). Post-traumatic stress disorder vs traumatic brain injury. Dialogues in Clinical Neuroscience, 13(3), 251–262.

Campbell, D. G., Felker, B. L., Liu, C.-F., Yano, E. M., Kirchner, J. E., Chan, D., Rubenstein, L. V., & Chaney, E. F. (2007). Prevalence of depression–PTSD comorbidity: Implications for clinical practice guidelines and primary care-based interventions. Society of General Internal Medicine, 22, 711–718. DOI: https://doi.org/10.1007/s11606-006-0101-4

Campbell, D. T., & Stanley, J. C. (1963). Experimental and quasi-experimental designs for research. Houghton Mifflin Company.

Carlson, K. F., Kehle, S. M., Meis, L. A., Greer, N., MacDonald, R., Rutks, I., Sayer, N. A., Dobscha, S. K., & Wilt, T. J. (2011). Prevalence, assessment and treatment of mild traumatic brain injury and posttraumatic stress disorder: A systematic review of the evidence. Journal of Head Trauma Rehabilitation, 26(2), 103–115. DOI: https://doi.org/10.1097/HTR.0b013e3181e50ef1

Clason, D. L., & Mundfrom, D. J. (2012). Adjusted means in analysis of covariance: Are they meaningful? Multiple Linear Regression Viewpoints, 38(1), 8–15.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed., pp. 1–17). Lawrence Erlbaum Associates.

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

Cukor, J., Spitalnick, J., Difede, J., Rizzo, A., & Rothbaum, B. O. (2009). Emerging treatments for PTSD. Clinical Psychology Review. https://www.thevespiary.org/rhodium/Rhodium/Vespiari/talk/files/6133-clinical_psychology_ptsd_review5d03.pdf. DOI: https://doi.org/10.1016/j.cpr.2009.09.001

Currier, J. M., Holland, J. M., & Drescher, K. D. (2015). Spirituality factors in the prediction of outcomes of PTSD treatment for U.S. military veterans. Journal of Traumatic Stress, 28, 57–64. DOI: https://doi.org/10.1002/jts.21978

Des Jarlais, D. C., Lyles, C., & Crepaz, N. (2004). Improving the reporting quality of nonrandomized evaluations of behavioral and public health interventions: The TREND statement. American Journal of Public Health, 94(3), 361–366. DOI: https://doi.org/10.2105/ AJPH.94.3.361

Dimitrov, D. M., & Rumrill, P. D., Jr. (2003). Pretest-posttest designs and measurement of change. Work, 20(2), 159–165.

Engel, G. L. (1980). The clinical application of the biopsychosocial model. American Journal of Psychiatry, 137(5), 534–544. DOI: https://doi.org/10.1176/ajp.137.5.535

Engelman, S. R. (2019). Animal-assisted intervention with those who are traumatized. In I. A. Serlin, S. Krippner, & K. Rockefeller (Eds.), Integrated care for the traumatized: A whole person approach (pp. 73–89). Rowman & Littlefield.

Field, A. (2016). Discovering statistics: Analysis of covariance (ANCOVA). https://www.discoveringstatistics.com/repository/ancova.pdf

Field, A. (2018). Discovering statistics using IBM SPSS statistics (5th ed.). Sage.

Fissette, C. L., Snyder, D. K., Dallessandra-Durbin, C., Balsis, S., Cigrang, J., Talcott, G. W., Tatum, J., Baker, M., Cassidy, D., Sonnek, S., Heyman, R. E., & Slep, A. M. S. (2014). Assessing posttraumatic stress in military service members: Improving efficiency and accuracy. Psychological Assessment, 26(1), 1–7. DOI: https://doi.org/10.1037/a0034315

Foa, E. B., Hembree, E. A., Cahill, S. P., Rauch, S. A., Riggis, D. S., Feeny, N. C., & Yadin, E. (2005). Randomized trial of prolonged exposure for posttraumatic stress disorder with and without cognitive restructuring: Outcome at academic and community clinics. Journal of Consulting and Clinical Psychology, 73(5), 953–964. DOI: https://doi.org/10.1037/0022-006X.73.5.953

Friedman, M. J. (2006). Posttraumatic stress disorder among military returnees from Iraq and Afghanistan. American Journal of Psychiatry, 163(4), 586–593. DOI: https://doi.org/10.1176/appi.ajp.163.4.586

Gibbs, D. A., Rae Olmsted, K. L., Brown, J. M., & Clinton-Sherrod, A. M. (2011). Dynamics of stigma for alcohol and mental health treatment among army soldiers. Military Psychology, 23(1), 36–51. DOI: https://doi.org/10.1080/08995605.2011.534409

Goetter, E. M., Bui, E., Ojserkis, R. A., Zakarian, R. J., Brendel, R. W., & Simon, N. M. (2015). A systematic review of dropout from psychotherapy for posttraumatic stress disorder among Iraq and Afghanistan
Harms, N. (2016). Treatment initiation and dropout from therapy for PTSD among veterans. *Journal of Traumatic Stress, 28*, 401–409. DOI: https://doi.org/10.1002/jts.22038

Gradus, J. L. (2017). PTSD and death from suicide. *National Center for PTSD: PTSD Research Quarterly, 28*(4), 1–8.

Held, P., & Owens, G. P. (2013). Stigmas and attitudes toward seeking mental health treatment in a sample of veterans and active duty service members. *Traumatology, 19*(2), 136–143. DOI: https://doi.org/10.1177/1534765612455227

Hoge, C. W., Castro, C. A., Messer, S. C., McGurk, D., Cotting, D. I., & Koffman, R. L. (2004). Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *The New England Journal of Medicine, 351*(1), 13–22. DOI: https://doi.org/10.1056/NEJMoao40603

Hunt, M. G., & Rosenheck, R. A. (2011). Psychotherapy in mental health clinics of the department of veteran affairs. *Journal of Clinical Psychology, 67*(6), 561–573. DOI: https://doi.org/10.1002/jclp.20788

Institute of Medicine. (2014). Treatment for posttraumatic stress disorder in military and veteran populations: Final assessment. *Military Medicine, 179*(12), 1401–1403. DOI: https://doi.org/10.7205/MILMED-D-14-00418

Johnson, B. D., Bormann, J. E., & Glaser, D. (2015). Validation of the functional assessment of chronic illness therapy—spiritual well-being scale in veterans with PTSD. *Spirituality in Clinical Practice, 2*(1), 25–35. DOI: https://doi.org/10.1037/scp0000052

Johnson, R. A., Albright, D. L., Marzolf, J. R., Bibbo, J. L., Yaglem, H. D., Crowder, S. M., Carlisle, G. K., Willard, A., Russell, C. L., Grindler, K., Osterling, S., Wassman, M., & Harms, N. (2018). Effects of therapeutic horseback riding on post-traumatic stress disorder in military veterans. *Military Medical Research, 5*(3), 1–13. DOI: https://doi.org/10.1186/s40779-018-0149-6

Jonas, W. B., Schoomaker, E., Marzolf, J. R., & Gaudet, T. (2019). Finding the cause of the crises: Opioids, pain, suicide, obesity, and other epidemics. *The New England Journal of Medicine*. https://catalyst.nejm.org/case-causes-whole-health-whole-person/

Kehle-Forbes, S. M., Meis, L. A., Spoont, M. R., & Polusny, M. A. (2016). Treatment initiation and dropout from prolonged exposure and cognitive processing therapy in a VA outpatient clinic. *Psychological Trauma, 8*, 107–114. DOI: https://doi.org/10.1037/tra0000065

Kim, E. S., & Willson, V. L. (2010). Evaluating pretest effects in pre-post studies. *Educational and Psychological Measurement, 70*(5), 744–759. DOI: https://doi.org/10.1177/0013164410366687

Klontz, B. T., Bivens, A., Leinart, D., & Klontz, T. (2007). The effectiveness of equine-assisted experiential therapy: Results of an open clinical trial. *Society and Animals, 15*, 257–267. DOI: https://doi.org/10.1163/156853007X217195

Koenig, H. G., Ames, D., Youssef, N. A., Oliver, J. P. Volk, F., Teng, E. J., Haynes, K., Erickson, A. D., Arnold, I., O’Garo, K., & Pearce, M. (2018). The moral injury symptom scale-Military version. *Journal of Religious Health, 57*, 249–265. DOI: https://doi.org/10.1007/s10943-017-0531-9

Kornfield, S. L., Klaus, J., McKay, C., Helstrom, A., & Oslin, D. (2012). Subsyndromal posttraumatic stress disorder symptomatology in primary care military veterans: Treatment implications. *Psychological Services, 9*(4), 383–389. DOI: https://doi.org/10.1037/a0028082

Krippner, S., Pitchford, D. B., & Davies, J. (2012). *Post-traumatic stress disorder: Biographies of disease*. Greenwood.

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology, 4*(863), 1–12. DOI: https://doi.org/10.3389/fpsyg.2013.00863

Lancia, J. (2008). Ascent from hell: EAP in the treatment of war veterans. *EAGALA in Practice, 9*-12. https://www.windhorsefarmllc.com/Ascent%20From%20Hell-1.pdf

Lanning, B. A., & Krenk, N. (2013). Examining effects of equine-assisted activities to help combat veterans improve quality of life. *Journal of Rehabilitation Research & Development, 50*(8), xvi–xxii. DOI: https://doi.org/10.1682/JRRD.2013.07.0159

Levenson, M. R., Jennings, P. A., Aldwin, C. M., & Shiraishi, R. W. (2005). Self-transcendence: Conceptualization and measurement. *International Journal of Aging & Human Development, 60*(2), 127–143. DOI: https://doi.org/10.2190/XRXM-FYRA-7U0X-GRC0

Levy, Y., & Ellis, T. J. (2011). A guide for novice researchers on experimental and quasi-experimental studies in information systems research. *Interdisciplinary Journal of Information, Knowledge, and Management, 6*, 151–160. DOI: https://doi.org/10.28945/1373

Maria, O., Monica, F., Lynee, R., Teresa, M., & Sarah, K. (2018). Taking the reins: U.S. veterans and equine assisted activities and therapies. *Journal of Trauma & Treatment, 7*(3), 1–4. DOI: https://doi.org/10.4172/2167-1222.1000427

Marx, B. P., & Gutner, C. A. (2015). Posttraumatic stress disorder: Patient interview, clinical assessment, and diagnosis. In N. C. Bernardy and M. J. Friedman (Eds.), *A practical guide to PTSD treatment: Pharmacological and psychotherapeutic approaches* (pp. 35–52). American Psychological Association. DOI: https://doi.org/10.1037/14522-004

Mathersul, D. C., Tang, J. S., Schulz-Heik, R. J., Avery, T. J., Seppala, E. M., & Bayley, P. J. (2018). Study protocol for a non-inferiority randomized controlled trial of SKY breathing meditation versus cognitive processing therapy for PTSD among veterans. *British Medical
Phillips, D. (2016, July 7). Suicide rate among veterans has risen sharply since 2001. New York Times. https://www.nytimes.com/2016/07/08/us/suicide-rate-among-veterans-has-risen-sharply-since-2001.html

PATH Intl. (2020). Professional Association of Therapeutic Horsemanship International. https://www.pathintl.org

Resick, P. A., & Schnicke, M. K. (1992). Cognitive processing therapy for sexual assault victims. Journal of Consulting and Clinical Psychology, 60(5), 748–756. DOI: https://doi.org/10.1037/0022-006X.60.5.748

Richardson, L. K., Frueh, B. C., & Acierno, R. (2010). Prevalence estimates of combat-related PTSD: A critical review. Australian & New Zealand Journal of Psychiatry, 44(1), 4–19. DOI: https://doi.org/10.3109/00048670903393597

Romaniuk, M., Evans, J., & Kidd, C. (2018). Evaluation of an equine-assisted therapy program for veterans who identify as ‘wounded, injured or ill’ and their partners. PLOS ONE, 13(9), 1–15. DOI: https://doi.org/10.1371/journal.pone.0203943

Rona, R. J. (2012). Long-term consequences of mild traumatic brain injury. The British Journal of Psychiatry, 201, 172–174. DOI: https://doi.org/10.1192/bjp.bp.111.11492

Schnurr, P. P., Friedman, M. J., Foy, D. W., Shea, M. T., Hsieh, F. Y., Lavori, P. W., Glynn, S. M., Wattenberg, M., & Bernardy, N. C. (2003). Randomized trial of trauma-focused group therapy for posttraumatic stress disorder: Results from a Department of Veteran Affairs cooperative study. Archives of General Psychiatry, 60, 481–489. DOI: https://doi.org/10.1001/archpsyc.60.5.481

Schottenbauer, M. A., Glass, C. R., Arnkoff, D. B., Tenderick, V., & Gray, S. H. (2008). Nonresponse and dropout rates in outcome studies on PTSD: Review and methodological considerations. Psychiatry Interpersonal & Biological Processes, 71(2), 134–168. DOI: https://doi.org/10.1521/psyc.2008.71.2.134

Selby, A., & Smith-Osborne, A. (2013). A systematic review of effectiveness of complementary and adjunct therapies and interventions involving equines. Health Psychology, 32(4), 418–432. DOI: https://doi.org/10.1037/a0029188

Shaley, A. Y., Bonne, O., & Eth, S. (1996). Treatment of posttraumatic stress disorder: A review. Psychosomatic Medicine, 58(2), 165–182. DOI: https://doi.org/10.1097/00006842-199603000-00012

Shapiro, F. (1989). Efficacy of the eye movement desensitization procedure in the treatment of traumatic memories. Journal of Traumatic Stress Studies, 2, 199–223. DOI: https://doi.org/10.1002/jts.2490020207

Sharp, M.-L., Fear, N. T., Rona, R. J., Wessely, S., Greenberg, N., Jones, N., & Goodwin, L. (2015). Stigma as a barrier to seeking health care among military personnel with mental health problems. Epidemiologic Reviews, 37, 144–162. DOI: https://doi.org/10.1093/epirev/mxu012
Nagrath, J. A., & Barber, J. P. (2011). A clinician’s guide to PTSD treatments for returning veterans. Professional Psychology, Research and Practice, 42(1), 8–15. DOI: https://doi.org/10.1037/a0022351

Sher, L., Braquehais, M. D., & Casas, M. (2012). Posttraumatic stress disorder, depression, and suicide in veterans. Cleveland Clinic Journal of Medicine, 79(2), 92–97. DOI: https://doi.org/10.3949/ccjm.79a.11069

Sloan, D. M., & Beck, J. G. (2016). Group treatment for PTSD. National Center for PTSD: PTSD Research Quarterly, 27(2), 1–9.

Sloan, D. M., Bovin, M. J., & Schnurr, P. P. (2012). Review of group treatment for PTSD. Journal of Rehabilitation Research & Development, 49(5), 689–702. DOI: https://doi.org/10.1682/JRRD.2011.07.0123

U.S. Department of Veteran Affairs. (2018b). PTSD and DSM-5. National Center for PTSD. https://www ptsd.va.gov/professional/treat/essentials/dsm5_ptsd.asp

U.S. Department of Veteran Affairs. (2018c). PTSD checklist-military version (PCL-M). National Center for PTSD. https://www ptsd.va.gov/professional/assessment/screens/index.asp

U.S. Department of Veteran Affairs. (2018d). Statistics at a glance. National Center for Veterans Analysis and Statistics, 1–6. https://www.va.gov/vetdata/docs/Quickfacts/Homepage_slideshow_3_31_18.PDF

U.S. Department of Veteran Affairs. (2018e). What is PTSD? National Center for PTSD. https://www ptsd.va.gov/public/PTSD-overview/basics/what-is-ptsd.asp

U.S. Department of Veteran Affairs. (2019). National veteran suicide prevention annual report. Office of Mental Health and Suicide Prevention. https://www.mentalhealth.va.gov/docs/data-sheets/2019/2019_National_Veteran_Suicide_Prevention_Annual_Report_508.pdf

U.S. Department of Veteran Affairs & U.S. Department of Defense. (2017). VA/DOD clinical practice guideline for the management of posttraumatic stress disorder and acute stress disorder. https://www.healthquality.va.gov/guidelines/MH/ptsd/VADoDPTSDCPGFinal012418.pdf

Wade, D. T., & Halligan, P. W. (2004). Do biomedical models of illness make for good healthcare systems? British Medical Journal, 329, 1398–1401. DOI: https://doi.org/10.1136/bmj.329.7479.1398

Weathers, F. W., Ruscio, A. M., & Keane, T. M. (1999). Psychometric properties of nine scoring rules for the clinician-administered Posttraumatic Stress Disorder Scale. Psychological Assessment, 11(2), 124–133. DOI: https://doi.org/10.1037/1040-3590.11.2.124

Yount, R., Ritchie, E. C., St. Laurent, M., Chumley, P., & Olmert, M. D. (2013). The role of service dog training in the treatment of combat-related PTSD. Psychiatric Annals, 43(6), 292–295. DOI: https://doi.org/10.3928/00485713-20130605-11