

Effectiveness of an Intensive Five-Day Program Using Multiple Treatment Modalities for
Veterans With Symptoms of Post-Traumatic Stress Disorder

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EFFECTIVENESS OF AN INTENSIVE FIVE-DAY PROGRAM USING MULTIPLE TREATMENT MODALITIES FOR
VETERANS WITH SYMPTOMS OF POST-TRAUMATIC STRESS DISORDER

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Abstract

This program evaluation quantifies the effectiveness of Idaho Horse Therapy's ReBoot program to treat veterans with symptoms of posttraumatic stress disorder (PTSD). The five-day, resident program integrates five treatment modalities to provide cognitive, emotional, experiential, and physiological treatment: Equine Assisted Activities; the Community Resilience Model, a psychoeducation on the biological basis of trauma; Eye Movement Desensitization and Reprocessing (EMDR); Integrated Breathing and Movement, a form of therapeutic martial arts; and Brainwave Optimization. Measures of depression, anxiety, dissociative experiences, quality of life, and hope were obtained at baseline, after the five-day program, and at 3-month follow-up. At intake, nearly all of the nine participants' assessment scores were indicative of clinically significant anxiety and depression; almost half of the participants' scores were indicative of dissociation typical of PTSD. During ReBoot, participants experienced large, statistically significant, improvements in anxiety, depression, dissociative experiences, hope, and quality of life. At 3-month follow-up, statistically significant improvement was maintained for depression, dissociative experiences, and hope, and was marginally significant for anxiety. Although this program evaluation is limited by the lack of a control group and small sample size, the ReBoot experience appears to be a powerful intervention for veterans with symptoms of PTSD.

Introduction

The number of combat veterans has increased dramatically over the past 15 years, with over 2.5 million having served since 9/11 and nearly 40 percent diagnosed with a psychological disorder (Cornish, Thys, Vogel, & Wade, 2014). Posttraumatic stress syndrome (PTSD) is particularly debilitating and is associated with suicide, attention and memory deficits, unemployment, poverty, homelessness, interpersonal issues, substance use, and continued susceptibility to stressors (Schmied, Larson, Highfill-McRoy, & Thomsen, 2016). PTSD in veterans potentially arises from both combat and noncombat experiences, such as prolonged separation from family, prolonged hypervigilance and exposure to stress, and military sexual trauma. Current prevalence of PTSD among U.S. men is estimated to be 1.8%, compared to 15% among male Vietnam War veterans, and 10%-14% among male Gulf War, Operation Enduring Freedom, and Operation Iraqi Freedom veterans (Kang, Natelson, Mahan, Lee, & Murphy, 2003; National Comorbidity Study, 2005; and Tanielian & Jaycox, 2008). The rate of suicide among veterans is of particular concern; the rate among U.S. males in 2009 was 11.8 per 100,000 compared to 38.3 per 100,000 among male veterans using Veteran's Affairs services (Johnson et al., 2014; Kemp & Bossarte, 2014). Similarly, rates of PTSD and suicide are greater for female veterans than female civilians. Furthermore, both female and male veterans who are experiencing psychological difficulties tend to avoid seeking help (Golub, Vazan, Bennett, & Liberty, 2013; Maung, Nilsson, Berkel, & Kelly, 2017). Common beliefs are that seeking help is a sign of moral weakness, they will be stigmatized by others, talk therapy will not work, and there will be a long waitlist for receiving services (Cornish et al., 2014). The need for programs to help veterans is greater than ever before, and there is a particular need for those programs to be non-stigmatizing, readily available, and attractive to veterans.

Idaho Horse Therapy has designed a novel, integrative program specifically for veterans who live with PTSD symptoms. The five-day resident ReBoot program, offered free of charge, incorporates five treatment modalities provided by experts in the field: 1) Equine Assisted Activities (EAA); 2) Community Resilience Model (CRM); 3) Eye Movement Desensitization and Reprocessing (EMDR); 4) Integrated Breathing and Movement (IBAM), a form of therapeutic martial arts; and 5) Brainwave Optimization (BWO). Although each treatment modality is supported by theoretical and empirical research, the effectiveness of the combined modalities offered in a five-day form, has not been investigated. Idaho Horse Therapy requested an evaluation of their program as a cooperative effort with Northwest Nazarene University's Counselor Education Department. It is an ongoing effort—a second evaluation will incorporate a 6-month follow-up, qualitative measures, and the effectiveness of a ReUnion experience held for participants three months after ReBoot. The program evaluation described here is a quantitative, non-experimental study to evaluate the effectiveness of the ReBoot experience to reduce anxiety, depression, and other symptoms of PTSD, and to increase hope and quality of life satisfaction. It uses self-report assessments given at pre-treatment, post-treatment, and 3-month follow-up.

Literature Review

The following literature review provides a conceptual basis for the use of each modality in treating trauma. Appendix A provides a more complete review, but is not meant to be comprehensive. More emphasis is placed on modalities that are less well-studied.

Trauma

Trauma results from events that are experienced by an individual as physically or emotionally harmful or threatening and that have lasting adverse effects on the individual's functioning and physical, social, emotional, or spiritual well-being" (Substance Abuse and Mental Health Services Administration [SAMHSA], 2014). PTSD is a prolonged psychophysiological response to trauma, and in the DSM-5, is characterized by three clusters of symptoms: re-experiencing (e.g., intrusive thoughts, nightmares, flashbacks), avoidance (e.g., emotional numbing; avoiding feelings, places associates with the trauma), and hyperarousal (e.g., difficulty sleeping, exaggerated startle response, hypervigilance). Trauma does not always result in PTSD, and may be modulated, in part, by prior exposure to trauma, especially in childhood.

Complex trauma arises from multiple exposures to maltreatment in childhood, such as neglect, emotional, physical, or sexual abuse, and witnessing domestic violence (van der Kolk, 2014). The initial childhood trauma often leads to revictimization and chronic trauma exposure throughout life due to poor emotional and impulse regulation, and inability to detect or respond to danger cues. Childhood trauma is correlated with PTSD, affective disorders, eating disorders, addictions, aggression, suicidality, dissociative and somatoform disorders, cancer, heart disease, and other health concerns (Felitti et al., 1998; Norman, Byambaa, De, Butchart, Scott, & Vos, 2012).

PTSD is often difficult to treat and is compounded by depression and anxiety disorders. In a meta-analysis of studies through 2003, only 56% of clients who entered cognitive behavioral therapy (CBT), EMDR, or exposure-based treatments no longer met diagnostic criteria for PTSD after treatment (Bradley, Greene, Russ, Dutra, & Westen, 2005). It was encouraging, however, that treatment success was related to publication date, suggesting that new treatments were more effective. More recently, neurobiological studies (e.g., Farina et al., 2015; Pagani et al., 2012; Porges, 2007) have greatly improved our conceptualization of trauma and effective treatments (van der Kolk, 2006; van der Kolk, 2014). One result has been an increasing interest in incorporating adjunctive experiential therapies, such as mindfulness, yoga, and animal-assisted therapy – bottom-up methods that calm physical tensions, improve emotional regulation, and increase the capacity for interoception and the tolerance of feelings and sensations (van der Kolk, 2006; van der Kolk et al., 2014).

Equine-Assisted Psychotherapy

Conceptualization and theory. Equine-assisted psychotherapy (EAP) is an experiential process in which a mental health specialist and equine specialist work with suitable horses and clients to meet mental health goals (Bachi, 2013). Equine-assisted activity (EAA), as used here, involves ground-based therapeutic activities similar to EAP, but conducted without a mental health specialist (e.g., Graham, 2007; Holmes, Goodwin, Redhead, & Goymour, 2012). EAA and EAP consist of ground-based activities, and are distinguished from hippotherapy which involves therapeutic mounted activities designed to treat physical disabilities (Bachi, 2013). Most studies reviewed here used EAP, with the exception of Graham (2007) and Holmes et al. (2012) who used EAA.

In comparison to other forms of psychotherapy, EAP is conceptualized as being particularly appropriate for clients who have been resistant or inaccessible in more conventional therapy. It may be especially appropriate for individuals experiencing grief (Symington, 2012) or recovering from abuse or trauma (Meinersmann, Bradberry, & Roberts, 2008; Schroeder & Stroud, 2015). Veterans appear to be particularly attracted to EAP because it is held in an outdoor setting; it is a hands-on treatment that translates emotions and insights into action; and it is associated with less stigma than other types of treatment (Equine Assisted Veteran Services [EAVS], 2013).

EAP fits well with experiential, gestalt, cognitive-behavioral, and attachment theory (Bachi, 2013). In EAP, horses provide acceptance and non-judgment, and facilitate a sense of safety with self and others (Bachi, 2013). The horse's combination of size and power, coupled with gentleness, provides a rich milieu in which to promote trust, leadership, self-confidence, and boundaries. In EAP, horses also mirror the affect of the client and facilitate awareness and interpretation of nonverbal behavior. As a prey and social animal, a horse naturally reads, and reacts to, the emotions and intentions of people and other animals, thus serving as a spontaneous mirror of the emotion and body language of the client (Bachi, 2013). For example, approach by an anxious client will be reflected in the horse's tension and movements, thus providing feedback to the client about his or her own tension, body language, and emotions. It is common for EAP participants to report a deeper connection to their feelings, especially those of grief (Masini, 2010). The horse's behavior is also used as a metaphor and projection of the client's feelings, and the client is encouraged to interpret the mental state and behavior of the horse (Bachi, 2013). For example, the client may interpret a horse standing outside the herd as being "left out", providing the therapist with fertile grounds for exploring the client's own feelings.

And finally, the nonverbal touching between horse and client can be a powerful intervention to assist individuals who have experienced extreme early trauma and react negatively to human touch.

Effectiveness. EAP is growing in popularity as a sole or adjunct treatment for recovery from trauma. Most studies have found mild to moderate symptom improvement in children and adolescents (reviews in Lentini & Knox, 2015; Selby & Smith-Osborne, 2013), including those recovering from intra-family violence (Schultz, Remick-Barlow, & Robbins, 2007), sexual abuse (Kemp, Signal, Botros, Taylor, & Prentice, 2014; Signal, Taylor, Botros, Prentice, Lazarus, 2013), PTSD symptoms (McCullough, Risley-Curtiss, & Rorke, 2015), emotional disorders (Holmes et al., 2012), and those considered at-risk (Bachi, Terkel, & Teichman, 2012; Trotter, Chandler, Goodwin-Bond, & Casey, 2008). EAP as a treatment for trauma in adults is less well researched, but quantitative studies indicate it is a promising approach for adults recovering from sexual abuse (Signal et al., 2013), intimate partner violence (Whittlesey-Jerome, 2014), catastrophic loss (Graham, 2007), and PTSD (Earles, Vernon, & Yetz, 2015; EAVS, 2013). See Appendix A for details.

A literature review revealed one quantitative study of EAP in veterans. In an EAP program of four weekly 90-minute group sessions, 72% of the 18 veterans showed statistically significant decreases in PTSD symptoms and 50% showed clinically significant decreases in symptoms (EAVS, 2013). In qualitative studies, veterans described the benefits of EAP as improving spiritual connections, knowledge of self, and trust and respect of others (Ferruolo, 2015). Veterans receiving EAP have also reported less avoidance of people, less detachment from surroundings, and improved physical symptoms (Lanning & Krennek, 2013).

Despite the promising results of EAP, many studies are limited by design flaws such as no control or no random assignment to control, self-reports, lack of standardized treatment or integrity checks, lack of follow-up data, and small sample size (Anestis, Anestis, Zawilinski, Hopkins, & Lilienfeld, 2014). Carefully designed randomized control trials are needed to establish EAP's status as an evidence-based treatment.

Eye Movement Desensitization and Reprocessing (EMDR)

Conceptualization. EMDR is a treatment designed to treat distress associated with traumatic memories (Shapiro, 2001). It is a standardized, manualized treatment, with training and certification available from the EMDR International Association. In EMDR, the client attends to disturbing material while simultaneously focusing on therapist-directed lateral eye movements (or bilateral tactile or auditory stimulation). In the adaptive information processing model that underlies EMDR, everyday experiences are thought to be processed to an adaptive state and become part of memory networks linked to one another by beliefs, thoughts, images, emotions, and sensations. Traumatic memories are thought to be stored as poorly processed networks that have not been integrated with more adaptive material, are easily triggered, and become the basis of dysfunctional reactions. EMDR is thought to access the traumatic memory network and promote new associations to more adaptive material, thus lessening emotional distress and promoting new cognitive insights. Recently, Pagani et al. (2012) provided neurobiological evidence that EMDR leads to cognitive processing of emotional material: traumatic memories activate the emotional fronto-limbic cortex prior to EMDR, and after EMDR, the memory activates the cognitive temporo-occipital cortex.

Effectiveness. EMDR, along with exposure therapy and stress inoculation therapy, is one of three methods empirically supported for the treatment of PTSD (Chambless et al., 1998), and

has been given the same status as CBT as an effective treatment for acute and chronic PTSD (American Psychological Association [APA], 2004). The Veteran's Administration also lists EMDR as one of four therapies with the highest level of evidence for PTSD treatment, along with cognitive therapy, exposure therapy, and stress inoculation therapy (Department of Veteran's Affairs & Department of Defense, 2010). Meta-analyses and reviews have typically found EMDR to be highly effective, and equivalent or superior to CBT in achieving outcomes, but to require fewer sessions (Bradley et al., 2005; Chen et al., 2014; Davidson & Parker, 2001; van Etten & Taylor, 1998). In a study of combat veterans, EMDR resulted in a 77% reduction of PTSD symptoms (Carlson, Chemtob, Rusnak, Hedlund, & Muraoka, 1998). Other benefits of EMDR relative to CBT-based therapies are that it does not require detailed descriptions of the event, extended exposure, direct challenging of beliefs, or homework.

Brainwave Optimization (BWO)

Conceptualization. Brainwave Optimization (BWO), also called high-resolution, relational, resonance-based, electroencephalic mirroring (HIRREM), is an experimental technique that is hypothesized to auto-calibrate oscillatory neural networks (Gerdes, Gerdes, Lee, & Tegeler, 2013; Lee et al., 2014). The model posits that the two brain hemispheres perform optimally when homologous neuro-anatomical brain regions produce balanced patterns of EEG activation. The mirroring, and thus auto-calibration, is achieved by reading brain activity through EEG sensors placed on the scalp; a computer algorithm translates the neural oscillations into musical notes that are played back to the participant through headphones in near real-time. As a result of this process, symmetry is increased between homologous regions in the left and right hemispheres, and balance between high and low frequency amplitudes within a lobe is restored (with the goal being lower amplitudes of high frequencies relative to low frequencies). The auto-

calibration is hypothesized to occur through resonance-based dissipation or accretion of neural energy (Gerdes et al., 2013; Lee et al., 2014). Participants report a sense of deep relaxation during and after the session. During the initial session, brain regions that need auto-calibration are identified. In a typical 90-minute session, five to eight brain regions are trained; the optimal treatment protocol is 7 sessions provided over 4 to 7 days. BWO differs from neurofeedback in that it does not require voluntary learning and does not rely on movement towards “normality” as defined by an EEG database.

The logic of using BWO to reduce trauma symptoms can be demonstrated with an example of temporal lobe functioning. The right temporal lobe mediates activity of the sympathetic nervous system, i.e., the fight-flight response, and the left temporal lobe mediates activity of the parasympathetic nervous system, i.e., the freeze response (reviewed in Lee et al., 2014; Tegeler, Shaltout, Tegeler, Gerdes, & Lee, 2015). When right temporal EEG amplitudes are considerably higher than left lobe amplitudes, sympathetic nervous system dominance is expressed as anxiety, hyper-vigilance, and hyper-arousal. When left temporal lobe amplitudes are considerably higher than right lobe, the parasympathetic nervous system dominance is expressed as emotional numbness, under-activity, and under-arousal. In EEG recordings of clients who have experienced trauma, one may see a dominance of either the right or left temporal lobe. After BWO, the left and right amplitudes are expected to be balanced and corresponding sympathetic or autonomic symptoms reduced.

Effectiveness. BWO is a new and experimental method on which few research studies have been completed. To assess the ability of BWO to improve insomnia, Tegeler et al. (2012) performed a randomized control study of 20 individuals with insomnia assigned to a usual care control and a BWO plus usual care group. The BWO group improved significantly on the

Insomnia Severity Index and the control group did not. The control group was then also provided BWO and showed improvements similarly to the original BWO group. The positive effects persisted for four weeks. In a second study, Tegeler, Tegeler, Cook, Lee, and Pajewski (2015) found that in 12 menopausal women, BWO reduced hot flash severity, and symptoms of depression and insomnia. As expected, the left and right temporal lobe high frequency oscillations decreased in amplitude. In a third study, Tegeler et al. (2016) found that 15 athletes with persisting post-concussion symptoms improved in post-concussion symptoms, insomnia, depression, reaction time, blood pressure and heart rate variability after 18 BWO sessions. All returned to full exercise and 10 returned to full participation in their sport within three months.

Community Resiliency Model™ (CRM).

Conceptualization. CRM is a psychoeducation training designed to teach communities the biological basis of trauma and to teach general wellness skills, including attunement to somatic experiences (www.traumaresourceinstitute.com). Psychoeducation is an important part of trauma-informed therapies (e.g., trauma-informed cognitive behavioral therapy, and EMDR), especially as a means of providing the individual and their support group a common understanding of the biological nature of trauma symptoms. One goal of emphasizing the biological nature of reactions is to decrease the perception that reactions are a sign of mental weakness, thus decreasing the shame and stigma associated with symptoms of trauma, and increasing hope for resolution of symptoms. CRM has been used in military settings and worldwide in communities experiencing natural and human-caused disasters (www.traumaresourceinstitute.com).

Effectiveness. In a study of 46 veterans provided CRM training, participants significantly improved in measures of anxiety, hostility, and depression immediately after training, and results

remained positive at 3-month follow-up (Citron, 2013). There were positive, but nonsignificant, improvements in somatic symptoms and in indicators of well-being such as being relaxed, contented, and friendly. At 3-month follow-up, 82% of participants reported that they were using skills daily to several times per week. Qualitative reports from participants also indicated that they perceived CRM would be beneficial to populations experiencing distress, anxiety, depression, anger, hopelessness, and physical pain.

Integrative Breathing and Movement (IBAM).

Conceptualization and theory. IBAM is a form of therapeutic martial arts that integrates mindfulness, deep breathing, and slow, focused movements (www.sawtoothmartialarts.com). Its goal is to decrease chronic fatigue and pain, relieve stress, optimize health, and increase physical and emotional resilience. It was developed specifically for veterans and other individuals coping with physical and psychological injuries. Although there is little direct research on using therapeutic martial arts in treating trauma, there is research on the value of treating trauma with IBAM's three components: attention to movements (e.g., yoga), mindfulness, and breath.

Similar to IBAM, most forms of yoga also incorporate mindfulness and attention to movement and breath. In particular, trauma-informed yoga specifically brings attention to the present moment, making choices, taking effective action, and synchronizing breathing and movement (Emerson, Sharma, Chaudhry, & Turner, 2009). Yoga and mindfulness have become popular adjunctive treatments for veterans with PTSD symptoms. Yoga has been implemented in nearly 29% of the specialized PTSD programs within the Veteran's Administration, and mindfulness instruction in more than 75%, often as a component of mindfulness-based stress

reduction (MBSR) or mindfulness-based cognitive therapy (MBCT) (Libby, Reddy, Pilver, & Desai, 2012).

Yoga appears to regulate the physical stress response, leading to an increase in well-being. Several specific mechanisms of action have been proposed. Yoga has been shown to increase brain gamma-aminobutyric acid (GABA) levels, suggesting an ameliorative effect on conditions marked by low GABA levels, such as PTSD, depression, and anxiety (Streeter et al., 2007). Yoga is also thought to stimulate neural growth and connectivity among brain regions that are involved in trust, control, pleasure, and social engagement (van der Kolk et al., 2014). More specifically, yoga appears to activate interoceptive and sensorimotor neural pathways, helping to reduce the physiological trauma responses stored in the body (Emerson et al., 2009). And finally, yoga poses bring awareness and tolerance to physical sensations, which assists in disconnecting the physical sensation from the emotional reaction associated with past trauma (Hölzel et al., 2011).

Mindfulness, a component of IBAM and yoga, plays a key role in several popular psychotherapies, including acceptance and commitment therapy (ACT), dialectical behavior therapy (DBT), mindfulness-based cognitive therapy, trauma-informed CBT, and MBSR. MBSR is a standardized mindfulness practice (Kabat-Zinn, 1982) and is particularly well studied. Mindfulness is thought to work by bringing awareness to the transitory nature of one's momentary experience which leads to a change in the perspective on self (Hölzel et al., 2011). Mindfulness also cultivates flexibility, curiosity, acceptance, and nonjudgment which can improve mood, motivate behavioral change, decrease experiential avoidance, and decrease emotional over-arousal (reviewed in Gallegos, Cross, & Pigeon, 2015). Physiologically, meditation has been shown to activate and produce structural and functional changes in specific

parts of the brain that are involved in self-referential processes, including self-awareness and self-regulation, interoception, adaptive behavior, and focused problem-solving (based on meta-analysis of magnetic resonance imagery [MRI] studies; Boccia, Piccardi, & Gauriglia, 2015). Attention to breath can decrease hyperarousal, and affect autonomic nervous system functions, including heart rate variability, a measure of the autonomic nervous system's self-regulatory ability (Brown & Gerbarg, 2005). Heart rate variability appears to be related to the ability to control unwanted memories and intrusive thoughts, PTSD severity, and the tendency to develop PTSD (Gillie & Thayer, 2014).

Effectiveness. Telles, Singh, and Balkrishna (2012) reviewed 12 quantitative studies, including seven randomized control trials (RCTs), and found that yoga and meditation reduced trauma symptoms in civilians in all studies. Hilton et al. (2016) reviewed 10 RCT studies using MBSR, yoga, or mantra repetition to treat PTSD, including six on veterans, and found that the mindfulness-based treatments typically decreased symptoms of depression and PTSD compared to control groups. Both Telles et al. and Hilton et al. rated the quality of evidence as low to moderate due to design flaws. A third systematic review concluded that mindfulness-based interventions, as adjunctive treatment, reduced symptoms and relapse rate in veterans with depression; reduced symptoms and improved quality of life and mindfulness in veterans with PTSD; and sometimes, but not consistently, reduced symptoms for veterans with anxiety alone (Khusid & Vythilingam, 2016). Appendix A and the brief review below describes recent studies on veterans using yoga, MBSR, mindfulness, and meditation.

In two recent RCTs of veterans, Sudarshan Kriya yoga, a breathing-based meditation, reduced PTSD scores, anxiety scores, and respiration rate (Seppälä et al., 2014), and improved

hyperarousal symptoms of PTSD, sleep quality, and daytime dysfunction related to loss of sleep (Staples, Hamilton, & Uddo, 2013).

Effectiveness of MBSR to treat PTSD and depression in veterans was evaluated in three recent RCTs. In one, MBSR, compared to treatment-as-usual, had no reliable effect on PTSD or depression, but improved mental health-related quality of life scores; for individuals who completed at least four sessions of MBSR, depression and mindfulness skills were significantly improved (Kearney, McDermott, Malte, Martinez, & Simpson, 2013). In a similar study, MBSR produced significant decreases in chronic fatigue, pain, cognitive failures, and depression at post-treatment and 6-month follow-up; PTSD symptoms had decreased at post-treatment but not at 6-month follow-up (Kearney et al., 2016). In a third RCT, mindfulness activities (body scan and mindful breathing) decreased PTSD symptoms and depression, and increased mindfulness (Colgan, Christopher, Michael, & Wahbeh, 2015).

In non-RCTs of veterans, MBSR significantly improved PTSD symptoms, depression, behavioral activation, acceptance, mindfulness, and the mental component of the SF-8 (Kearney, McDermott, Malte, Martinez, & Simpson, 2012). And, loving-kindness meditation, provided in addition to treatment-as-usual, reduced PTSD symptoms and depression, and increased mindfulness and self-compassion (Kearney, Malte, et al., 2013).

Methods

Participants

The convenience sample consisted of veterans who reported symptoms of trauma. Potential participants learned about the ReBoot Program through the Veteran's Administration, their private counselors, support groups, therapeutic riding programs, and the directors of ReBoot directly. A licensed therapist, who was not otherwise involved in the program, provided screening of participants; researchers did not screen participants. Potential exclusion criteria included extreme drug or alcohol dependency, extremely high vigilance levels that could result in harm to self or others, high doses of medications that could preclude benefit of the ReBoot experience, and extreme lack of mobility. All individuals who were screened for inclusion and who participated in ReBoot were included in the research protocol. One participant dropped out after arrival, but prior to treatment, and is not included in analyses. Participants were provided informed consent specific to counselors and treatment modalities, and a separate informed consent for the research protocol. Participants were given the option to participate, or not participate, in treatment modalities and research throughout the week.

Participants included seven men and two women who served in either the active military or the National Guard. Participants included veterans who had been deployed, not been deployed, been in combat, and not been in combat. They served in Viet Nam (1), or as part of the Gulf War/Operation Enduring Freedom/Operation Iraqi Freedom (8), and ranged in age from late 20s to early 70s.

The research protocol for this program evaluation was approved by the Human Research Review Committee at Northwest Nazarene University in May 2016.

Procedures

ReBoot was held in a rural setting with corrals, an indoor and outdoor horse arena, and a large, open bunkhouse in which classroom activities and meals were provided. Participants provided their own camper trailer for lodging, or used one provided by IHT. Participants arrived the afternoon prior to, and departed the morning after, the five-day program. Participants' spouses and family members were invited to attend the first CRM class, but otherwise, family members were not at ReBoot. The atmosphere was relaxed, the schedule flexible, and ample opportunity was provided for participants to rest and explore the nearby river and countryside. At least one, and usually two or three, of the five student researchers were present during each day. Researchers interacted with participants, assisted with coordination of interventions, observed examples of each intervention, and administered assessment tools.

Within each of the five full days of ReBoot (May 16-20, 2016), participants rotated between EAA, EMDR, and BWO such that each participant received up to five sessions each of EMDR (60-90 minutes per session) and EAP (1-3 hours per session), and four sessions of BWO (30 to 60 minutes per session). CRM was taught in a small group setting of 4-5 participants on each of the first two days, for a total of two 3-hour trainings. IBAM group sessions were offered each morning and evening (a total of ten 45-minute sessions).

EMDR was provided by a licensed psychologist (PhD) and a licensed counselor (MS, LMHC, LCPC) who were EMDR certified and had 30 and 40 years of experience, respectively, and one licensed social worker (MS, LMSW) who was EMDR trained and had 1 year of experience. Three participants were assigned to each counselor based on perceived best fit. BWO was provided by a certified BWO provider, with 25 years of experience in the healing arts, who has been providing BWO since 2008 and was trained by and coordinates closely with the

originators of BWO. CRM was taught by a licensed counselor (MS, LCPC), with 30 years of experience providing psychotherapy to traumatized individuals, who has taught CRM nationally and internationally. IBAM was taught by the developer of IBAM who is a nationally certified master level instructor of martial arts with 36 years of experience in teaching martial arts.

The EAA used at ReBoot was based on the Equine Assisted Growth and Learning Association (EAGALA) model. EAA was provided by an EAGALA Certified Level II Equine Specialist who has 60 years of experience in horsemanship and over 18 years of experience using horses in therapeutic settings. He also served as the primary horse handler, owner of the horses, and is the director of Idaho Horse Therapy. Idaho Horse Therapy is a registered EAGALA Military Services Program. EAP is usually a coordinated effort between a licensed mental health therapist and an equine specialist. In the EAA at ReBoot, the equine specialist served both roles. Brief descriptions of the EAA activities at ReBoot are given in Appendix B.

Psychometric Measures

Assessments were given to participants upon their arrival at ReBoot, at the end of ReBoot, and again at 3 months, except that the Adverse Childhood Experiences Scale (ACES) was given only upon arrival. Assessments were given as self-reports and provided to participants in a group setting; two to four student researchers were available to address questions. Assessments were presented to participants in the same order at each sampling interval. Order of presentation of assessments has been shown to affect outcome response (Childs, 2005; Lucas, 1992). At the 3-month follow-up, assessments were presented to six participants in a group setting on August 12, to one by phone and one in person on August 26, and one participant could not be reached.

Adverse Childhood Experiences Scale (ACES). The ACES is an 11-item questionnaire that assesses adverse childhood experiences prior to age 18, such as physical, sexual, or emotional abuse, and the reliability of parents (e.g., were they alcoholic, depressed, or mentally ill). For the first five items, possible answers are ‘no’, ‘yes’, ‘don’t know’, and ‘decline to answer’. The remaining six items ask how often an incident happened and possible answers are ‘no’, ‘once’, ‘more than once’, ‘don’t know’, and ‘decline to answer’. The scoring system used here is binary: 0 = ‘no’; 1 = ‘yes’, ‘once’, or ‘more than once’. In general, scores of >3 are considered high (Felitti et al., 1998). There is considerable research that links adverse childhood experiences to a variety of adult illnesses, including everything from heart disease to alcoholism. There is also evidence that adverse childhood experiences increase a person’s likelihood of experiencing trauma as an adult. There is a dose-response relationship – the higher the ACES score, the more severe the long-term effect on a person’s health.

Hamilton Rating Scale for Anxiety (HAM-A). The Hamilton Rating Scale for Anxiety is a 14-item questionnaire used to assess symptoms of anxiety, including psychic symptoms (difficulty concentrating and remembering, depressed mood, anxious mood, tension, insomnia, and fear) and somatic symptoms (cardiovascular, muscular, respiratory, gastro-intestinal, sensory, and other autonomic symptoms) (Hamilton, 1959). Although designed to be a clinician-rated scale, participants completed the questionnaire themselves, while student researchers provided definitions of terms and answered questions. HAM-A uses a 5-point Likert scale for each item, and the total score is the sum of all items, with a range of possible scores of 0 to 56. Suggested diagnostic cut-offs are 14-17 for mild, 18-24 for moderate, and 25-30 for severe anxiety.

Hamilton Rating Scale for Depression (HAM-D). The Hamilton Depression Inventory is a 17-item assessment designed to be a clinician-rated scale for evaluating individuals who have been diagnosed with depression (Hamilton, 1960; Burnett, 1998). Although designed to be a clinician-rated scale, participants completed the questionnaire themselves, while student researchers provided definitions of terms and answered questions. HAM-D uses a 5-point Likert scale for 8 items and a 3-point Likert scale for 9 items. The total score is the sum of all items for a possible range of 0 to 50. Suggested diagnostic cut-offs are 8-16 for mild, 17-23 for moderate, and ≥ 24 for severe depression. For the 17-item scale, internal consistency estimates were 0.79, indicating moderate reliability, and the mean concurrent validity with other depression inventories (e.g., Beck Depression Inventory) was 0.67 (Burnett, 1998). The correlation between the clinician and self-report forms of the Hamilton Depression Inventory was 0.66 (Burnett, 1998).

Dissociative Experiences Scale-II (DES-II). The DES-II is a 28-item self-report questionnaire, taking about 10 minutes to complete, designed to quantify frequency of dissociative experiences within the past month (Carlson and Putnam, 1993). Questions are of the form “Some people have the experience of feeling as though they are standing next to themselves or watching themselves do something and they actually see themselves as if they were looking at another person. Circle the number to show what percentage of the time this happens to you. 0%, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100%”. The DES-II includes items for the three main factors of dissociation: amnesia (loss of memory, not recognizing family, finding evidence of having done things you don’t remember doing), depersonalization/derealization (feeling detached from one’s self or loss of reality, hearing voices, looking at world through a fog or from far away), and absorption (being preoccupied and distracted from surroundings,

feeling as if reliving past event, not sure whether memories really happened or did not, becoming involved in a fantasy or daydream as if it were really happening, losing track of passage of time). The total score is the sum of the 28 item scores with the trailing 0 dropped. The range of possible scores is 0 to 280. Cut-offs for normal and various pathological populations are provided with the assessment (e.g., general adult population = 5.4; PTSD = 31; DID = 48). The DES-II is considered to be well studied and psychometrically sound (Juni, 1995). A meta-analysis indicated average internal consistency of 0.93, convergent validity of 0.67, and test-retest reliability of 0.78-0.93 (van Ijzendoorn & Schuengel, 1996).

DSM-5 Level 1 Cross-Cutting Symptom Measure. The CCSM is a 23-item self-report questionnaire that assesses 13 psychiatric domains (APA, 2013): depression, anger, mania, anxiety, somatic symptoms, suicidal ideation, psychosis, sleep problems, memory, repetitive thoughts and behaviors, dissociation, personality functioning, and substance use. Its purpose to identify domains in which further assessment is likely needed, and to aid in tracking symptoms over time. Each question is rated on a 5-point scale (0=none or not at all; 1=slight or rare, less than a day or two; 2=mild or several days; 3=moderate or more than half the days; and 4=severe or nearly every day). The Domain Score for each of the 13 domains is the highest score on any item within the domain (range 0 to 4). For most domains, the “threshold to guide further inquiry” is a Domain Score ≥ 2 . For three domains (suicidal ideation, psychosis, and substance use), the threshold is a Domain Score ≥ 1 . The measure has good test-retest reliability (APA, 2013).

Hope Scale. Snyder et al. (1991) conceived of hope as a dispositional trait that includes enduring self-referential thoughts about one’s ability to pursue goals; the trait can be partitioned into agency (goal-directed determination) and pathways (planning ways to meet goals). The Hope Scale is a 12 item self-report questionnaire that has four items to assess agency, four to

assess pathways, and four that are filler questions and are not scored. This study used the eight-point Likert scale version (also available in a four-point version) which asks participants to select the number that best describes them on an eight-point scale from ‘definitely false’ to ‘definitely true’ (Snyder et al. 1991). The total score is the sum of the eight items; the possible range is 8 to 64. In a review of published studies using the Hope Scale, Hellman, Pittman, and Munoz (2013) found an average internal consistency of 0.82 and a high test-retest reliability of 0.80. Internal consistency and test-retest reliability were not correlated with sample characteristics such as sample size, average age, percent male, or percent Caucasian. These values suggest that the Hope construct is stable across time and situation and that the Hope Scale score is consistent across samples of populations with different characteristics.

Quality of Life Experience and Satisfaction – Short Form (QLES-Q-SF). The QLES-Q-SF is a self-report, 16-item questionnaire taking 3-5 minutes to complete (Endicott, Nee, Harrison, & Blumenthal, 1993). The first 14 items provide one composite score that assesses satisfaction with physical health, mood, relationships, living situation, economic status, sexual drive, general functioning, and activities related to household work, leisure, and work or hobbies. The last two items assess satisfaction with medication (if any) and overall life satisfaction. On each item, participants indicate their satisfaction during the past week using a 5-point Likert scale from ‘not at all or never’ to ‘frequently or all the time’. The raw total score is obtained by summing the responses on the 14 items; the range in raw total scores is 14 to 70. The composite score is a percentage calculated as $(\text{raw total score} - 14) / (70 - 14)$ and has a possible range of 0 to 100. The original QLES-Q and the QLES-Q-SF have high internal consistency reliability (> 0.85) and strong convergent validity with other measures such as the Hamilton Rating Scale for Depression (Caruso, 2001; Mick, Faraone, Spencer, Zhang, & Biederman, 2008; Wyrwich et al.,

2009). In a study of psychiatric hospital inpatients in Serbia, test-retest reliability was 0.93; the smallest detectable change (SDC), which is the smallest within-individual change in score that could be interpreted as a real change, was 6.34. The minimal important difference (MID), the minimal difference interpreted as clinically meaningful, varied among populations: 3.0 in an ADHD population (Mick et al., 2008), 6.8 in generalized anxiety disorder (Wyrwich et al., 2009), 8.95 in psychiatric inpatients (Stevanovic, 2011), and 11.89 in bipolar disorder (Endicott, Rajagopalan, Minkwitz, & Macfadden, 2007).

Statistical Analysis

For each assessment, paired t-tests were used to compare scores at pre-treatment to post-treatment ($N = 9$ participants), and at pre-treatment to 3-month follow-up ($N = 8$ participants). Effect sizes, Cohen's d , were calculated using Equation 3 for paired samples in Dunlap, Cortina, Vaslow and Burke (1996) and interpreted using cutoffs for small (0.20), medium (0.50), or large (0.80) effects (Cohen, 1977).

If a question within an assessment was left unanswered, it was scored equivalent to the participant's answer on the same question at the next closest testing interval (e.g., pre-treatment blanks filled in with post-treatment answers). For most assessments, there was little or no missing data: 0% for Ham-A, Hope; <1% for Ham-D and Cross-cutting; 1.9% for DES-II due to one person skipping the last seven questions. Most missing data came from the QLES-Q-SF (8.2% missing) where participants left blank activities that they did not feel were relevant. For example, at post-treatment, participants were instructed to report about satisfaction during the past week, a week when they were at ReBoot, not engaged in normal activities, and not with their spouse. Thus, questions frequently not answered were about household activities, work, and sex (6, 6, and 4 of the 9 participants, respectively).

Results

Participants showed a large and significant improvement in anxiety, depression, dissociative experiences, hope, and quality of life from before to after ReBoot. At 3-month follow-up, improvement in depression, dissociative experiences, and hope remained significant compared to before ReBoot, and improvement in anxiety was marginally significant.

Anxiety

On the HAM-A, before ReBoot, 8 of 9 participants had scores that indicated clinically significant anxiety (3 mild, 3 moderate, and 2 severe). After ReBoot, these 8 people had an average improvement in scores of 61%, 7 scored below the threshold for any diagnosis of anxiety, and 1 scored as having mild anxiety (Fig. 1). Overall, there was a statistically significant improvement in anxiety scores from before to after ReBoot and a large effect size ($d = 1.73$, $t = 4.12$, $p = 0.003$, Table 1). At the 3-month follow-up, 7 of 8 participants remained the same or had lower anxiety scores than before ReBoot (average improvement 34% for these 7 participants, $t = 5.15$, $p = 0.002$), but one participant showed an increase in anxiety, thus the overall change from before to follow-up was only marginally statistically significant ($t = 1.95$, $p = 0.09$, Table 2) and effect size was medium ($d = .72$).

Depression

Before ReBoot, 7 of 9 participants had HAM-D scores indicating clinically significant depression (2 mild, and 5 moderate). After ReBoot, these 7 participants had an average improvement in scores of 58%; 5 scored below the threshold for a diagnosis of depression, and 1 each scored as having mild and moderate depression (Fig. 1). Overall, scores on the depression scale improved significantly (45%) from before to after ReBoot ($t = 3.13$, $p = 0.01$, Table 1) and effect size was large ($d = 1.13$). At 3-month follow-up, scores remained significantly improved

(25%) compared to before ReBoot, with a medium effect size ($d = 0.59$, $t = 3.28$, $p = 0.01$, Table 2), and 5 people scoring as having mild depression and 3 as having no diagnosis of depression. Anxiety and depression scores were highly correlated pre- ($r = 0.81$) and post-treatment (0.90), and the degree of improvement in anxiety and depression were highly correlated (0.80).

Dissociative Experiences

On the DES-II, participants had significantly lower scores of dissociative experiences after ReBoot than before ($t = 3.51$, $p = 0.01$, Table 1) and effect size was large ($d = 1.08$). At 3-month follow-up, scores remained significantly lower than at pre-treatment ($t = 3.01$, $p = 0.02$, Table 2) and effect size remained large ($d = 0.88$). Before ReBoot, 4 individuals scored >30 , a score considered typical of individuals with PTSD (Carlson & Putnam, 1993). At 3-month follow-up, 3 of those 4 individuals scored <30 .

DSM-5 Level 1 Cross-Cutting Symptom Measure

The mean score in 9 of the 13 domains improved significantly from before to after ReBoot: Depression, Anger, Anxiety, Somatic Complaints, Suicidal Ideation, Sleep Problems, Memory, Dissociation, and Personality Functioning (Table 3). At 3-month follow-up, the mean score in 5 of the 13 domains remained significantly improved compared to pre-ReBoot: Depression, Anger, Anxiety, Somatic, and Sleep. In the other 4 domains that had improved from pre- to post-treatment, the pre- to follow-up comparison was marginally significant (i.e., $p < 0.10$). On average across the 13 domains, 6 participants scored above the threshold for further evaluation prior to ReBoot, and 1.3 participants scored above the threshold after ReBoot and at 3-month follow-up.

For the purpose of this study, CCSM was used to validate other assessments and explore symptoms not otherwise identified. The analysis includes a large number of multiple

comparisons (26) with no correction of significance level, and thus should be interpreted as exploratory. The most noteworthy result, not addressed by other assessments, is the significant improvement in the Anger, Sleep, Somatic Complaints, and Suicidal Ideation domains from pre- to post-treatment and at 3-month follow-up (marginally significant for Suicidal Ideation at follow-up).

Hope

On the Hope Scale, 7 of 9 participants scored higher after ReBoot than before (Fig. 1). Overall, scores on the Hope Scale improved significantly (24%) from before to after ReBoot ($t = 2.32, p = 0.048$, Table 1) and effect size was medium ($d = 0.59$). Hope continued to increase to the 3-month follow-up, when it remained statistically higher than before ReBoot ($t = 2.60, p = 0.04$, Table 2), with a large effect size ($d = 0.93$). Both before and after ReBoot, scores on the Hope Scale were negatively correlated with scores on HAM-D ($r = -0.74, -0.64$), HAM-A ($r = -0.86, -0.62$), and DES-II ($r = -0.91, -0.93$), and positively correlated with QLES-Q-SF ($r = 0.73, 0.87$).

Quality of Life

On the QLES-Q-SF, 8 of 9 participants scored higher after ReBoot than before (Fig. 1). The average improvement in scores was 52% ($t = 4.36, p = 0.002$, Table 1) and effect size was large ($d = 1.02$). At 3-month follow-up, quality of life scores remained 21% higher than prior to ReBoot, but the difference was not significant ($t = 0.88, p = 0.41$, Table 2). The lack of improvement at follow-up is heavily influenced by one participant who scored much lower at follow-up than either before or after ReBoot (Fig. 1). When that individual is removed from the sample, the 3-month follow-up scores were significantly higher than before ReBoot ($t = 3.14, p = 0.02$).

Adverse Childhood Experiences

Four of the 9 participants in ReBoot had high ACES scores (i.e., total score >3). Their scores were 5, 7, 8, and 9. The other five participants had scores of 0, 0, 2, 2, and 3. Correlations between ACES and depression, PTSD symptomology, and quality of life will be investigated in a later report.

EEG Data

The goal of BWO treatment was to obtain an acceptable degree of balance (between high and low frequency amplitudes) and harmony (symmetry between homologous lobes in the left and right hemispheres) for all brain regions. Within a session, EEG recordings clearly indicated an improvement in balance and harmony, often reaching acceptable levels within a session. It was common for the following session to begin with re-establishing balance and harmony to the original brain region, and then progress to other regions. Session length, number of sessions, number of brain regions treated, and final degree of harmony and balance achieved, varied among participants. The detailed quantitative analysis, to be presented in a later report, will be based on EEG output obtained from the first and last sessions conducted at ReBoot and the first session at 3-month follow-up.

Discussion

The ReBoot protocol, an integrative sequence of CRM, EMDR, EAA, IBAM, and BWO, appears to be a powerful intervention for veterans with symptoms of PTSD. At intake, nearly all ReBoot participants' assessment scores were indicative of clinically significant anxiety and depression; almost half of participants' scores were indicative of dissociation typical of PTSD; almost half reported suicidal ideation; and most reported symptoms of anger, somatic complaints, and sleep disturbances that would warrant further assessment and probable intervention. After ReBoot, participants improved substantially in symptoms of anxiety, depression, dissociative experiences, hope, and quality of life. Participants also improved on measures of anger, somatic complaints, sleep disturbances, and suicidal ideation. Although there is considerable literature supporting the efficacy of most individual modalities used at ReBoot, the combination of modalities and abbreviated five-day presentation has not been previously evaluated.

Veterans are often hesitant to seek services because of associated stigmas and belief that treatment will be inaccessible or ineffective (Cornish et al., 2014). In addition to providing quality, empirically-supported interventions, ReBoot was designed to be casual, normalizing, non-stigmatizing, and attractive to veterans (e.g., EAVS, 2013), with particular attention to an outdoor setting, hearty meals, and comradery-building.

Consistent with significant improvement of depression and anxiety in ReBoot participants at post-treatment and follow-up, reduced depression and anxiety has been documented in several studies of EAP (e.g., Earles et al., 2015; Signal et al., 2013), the Community Resilience Model (Citron, 2013), and EMDR (e.g., Bradley et al., 2005; Chen et al., 2014; Davidson & Parker, 2001; van Etten & Taylor, 1998). Brainwave optimization may also

reduce depression (Tegeler, Tegeler, et al., 2015). Mindfulness-based interventions such as yoga, MBSR, and meditation decreased depression in several studies (Colgan et al., 2015; Dahm et al., 2015; Hilton et al. 2016; Kearney, Malte, et al., 2013; Kearney et al., 2016; Khusid & Vythilingam, 2016), but their effectiveness on anxiety is described as mixed and insufficient to recommend it as a treatment (Hilton et al., 2016; Khusid & Vythilingam, 2016; but see Seppälä et al., 2014 and Staples et al., 2013 for positive effects of yoga on anxiety). Many studies of mindfulness did not assess anxiety independently from depression and PTSD, and indeed, assessing them independently is likely too simplistic. For example, MBSR was more effective than CBT in patients with moderate anxiety and depression, whereas CBT was more effective than MBSR in patients with high anxiety and no depression (Arch & Ayers, 2013). Among ReBoot participants, pre-treatment anxiety and depression were highly correlated, as were improvements in anxiety and depression.

Dissociative experience is one of the cluster of avoidance symptoms that is diagnostic of PTSD. Dissociative experiences decreased significantly from before to after ReBoot and at 3-month follow-up. In the few studies that directly assessed dissociative experiences or the avoidance subscale of PTSD, improvements were documented after EAP (Kemp et al., 2014), EMDR (Carlson et al., 1998; van Etten & Taylor, 1998), and loving-kindness meditation (Kearney et al., 2012), but not after breathing-based meditation or yoga (Seppälä et al., 2014; Staples et al., 2015). Studies that assessed total PTSD symptoms, found improvements after EAP (Earles et al., 2015; EAVS 2013; Kemp et al., 2014; McCullough et al., 2015), EMDR (Bradley et al, 2005; Carlson et al., 1998; Chambless et al., 1998; Chen et al., 2014; Davidson & Parker, 2001; van Etten & Taylor, 1998), and yoga or other mindfulness interventions (Carter et al., 2013; Colgan et al., 2015; Kearney et al., 2012, 2015; Kearney, Malte, et al., 2013; Staples et al.,

2015; and reviews by Hilton et al., 2016, and Khusid & Vythilingam, 2016; but see Kearney, McDermott, et al. 2013). It would be useful for future ReBoot program evaluations to include assessments of total PTSD symptoms in addition to the DES-II.

Avoidance and numbing symptoms of PTSD, such as dissociation, are typically associated with reduced life satisfaction (Lumney & Schnurr 2007; Schnurr, Lunney, Hayes, McFall, & Uddo, 2006). Mindfulness-based interventions are considered effective in improving life satisfaction among veterans with PTSD (Khusid & Vythilingam, 2016). However, interventions sometimes improve PTSD symptoms but not quality of life, and vice versa. For example, MBSR improved mental health-related quality of life scores but not symptoms of depression or PTSD (Kearney, McDermott, et al., 2013), while yoga improved PTSD symptoms but not quality of life (Staples et al., 2013). For ReBoot participants, all measures—quality of life scores, depression, anxiety, and dissociative experiences—improved considerably from before to after ReBoot.

Snyder et al. (1991) conceptualized individuals with high hope as having the mental energy and ability to identify strategies to attain goals (agency), and having confidence in their pathways to goals and in their ability to surpass barriers by finding alternative pathways (pathways). Empirical studies indicate that higher hope individuals have more goal attainment, better coping mechanisms, greater happiness, better physical recovery from injury, are more likely to engage in healthy behaviors and adjust to illnesses, and have less distress and less burnout (reviewed in Hellman et al., 2013). Hope is hypothesized to be stable across time and situations, and to mediate the effectiveness of interventions (Hellman et al., 2013). However, among Reboot participants, scores on the Hope Scale improved significantly from before to after ReBoot and improvement was maintained at 3-month follow-up, suggesting that the measure

was fluid, not stable across time. Hope was negatively correlated with depression, anxiety, and dissociative experiences, and positively correlated with quality of life satisfaction, both before and after ReBoot. In future studies with larger sample sizes, it would be valuable to explore the role of hope in potentially mediating improvement in PTSD, depression, and anxiety in ReBoot participants.

The ReBoot treatment modalities were specifically chosen to provide integrative cognitive, emotional, experiential, and physiological treatment of PTSD symptoms. The program appropriately began with CRM psychoeducation on the biological basis of trauma. Participants then experienced intensive processing during EMDR sessions, interspersed daily with more diffuse and gentle equine-assisted processing, and the mind-body connection of IBAM each morning and evening. BWO sessions, which tend to produce a sense of relaxation and rejuvenation, were also interspersed throughout, but concentrated towards the end of the week. Although limited by the lack of a control group and small sample size, and despite treatment modalities designed for use over longer periods, the ReBoot experience was associated with large improvement of scores on all assessments, and the maintenance of most results at 3-month follow-up.

Limitations and Suggestions for Future Research and ReBoot Designs

The conclusions of this research are limited by the use of a convenience sample of participants who learned of the program and applied to attend, the use of self-reports, certain characteristics of the assessments used, the lack of a control group, and a small sample size.

Convenience sample. Many program evaluations use a convenience sample. The participants that chose to attend ReBoot may have been drawn to the outdoor setting, the use of horses, or some other feature. Participants that are attracted to the treatment or setting may be

more likely to benefit, and thus exhibit larger treatment effects, than a randomly selected sample of individuals. The effect of a convenience sample would be somewhat ameliorated by having a proper control group and randomized assignment to treatment and control.

Self-reports. Demand characteristics likely had an important effect on the results of this study. In particular, it is likely that participants' self-reports were influenced by knowing that the assessments were being used as part of a program evaluation, especially given that participants universally approved of the program and wished it to continue (based on unpublished interviews). One might expect the demand characteristics to be less at 3-month follow-up when participants would likely have forgotten their pre-treatment responses, thus it is encouraging that symptom reduction was maintained at 3-month follow-up.

The inherent weakness in self-reports is common to most of the efficacy-outcome literature. Physiological measures are sometimes used to supplement self-report data but have their own short-comings. One potential solution would be clinician-rated pre- and post-assessments provided by an impartial clinician who is not otherwise involved with ReBoot and who is blind to any treatment vs. control group. At a minimum, self-report assessments should be described to participants as tools for identifying the individual's progress and need for follow-up care, and as research tools to perfect the types and quantity of therapy provided. The stability of the ReBoot program should be emphasized to diminish any notion that the participant's degree of improvement might affect funding or program continuation.

Assessments. Five suggestions regarding specific assessments may improve the research. First, the HAM-A and HAM-D were designed for clinician rating, but were used as self-rated forms. In an attempt to ameliorate this issue, researchers provided participants with definitions of terms and were available to answer questions during assessments. An alternative approach would

be to use well-studied, self-report assessments such as Beck's Depression Inventory-II and the Generalized Anxiety Disorder (GAD-7). Second, at each time interval, it would be beneficial to have a direct measure of PTSD symptoms, such as the commonly used PTSD Checklist – Civilian (PCL-C) or Clinician Administered PTSD Scale (CAPS). Third, although quality of life may be a clinically important construct that is not measured by other assessments, the QLES-Q-SF was difficult to interpret as a pre- vs. post-treatment measure because participants were asked to evaluate their satisfaction with everyday activities during the five-day program when they were not engaged in everyday activities. One solution would be to give the QLES-Q-SF at pre-treatment and 3-month follow-up, but not at post-treatment. Fourth, symptoms of anger and sleep disturbances are common in PTSD and among ReBoot participants, and thus it would be useful to include an assessment for anger and one for insomnia (e.g., Pittsburgh Sleep Quality Index). And fifth, to reduce paperwork required of each participant, especially given the addition of assessments for PTSD and insomnia, some less useful assessments could be excluded. In particular, the DSM-5 Cross-Cutting Symptom Measure did not provide a great deal of insight not available in the other assessments, and it is not well-researched or normed.

Control group. A control group is essential to quantifying the effects of the ReBoot program. One possibility is to use a wait-list control group in which participants would be randomly assigned to attend ReBoot in either month 1 or month 2. Both groups would be given assessments at intake, at month 1, month 2, immediately following their ReBoot experience, and at 3-and 6-months post-treatment. A stronger control would be to assign half the participants to attend a “no intervention” camp in a similar setting and fostering similar comradery (possibly including CRM, IBAM), but without EAA, BWO, or EMDR. The other half would attend a typical ReBoot program. The no-intervention participants could then be offered the ReBoot

program later in the summer. More complicated designs could be used to evaluate the relative effects of EAA, EMDR, and BWO by offering only one treatment per camp or offering EAA + EMDR in one camp, EAA + BWO in a second camp, and no intervention control in a third camp. The results could be used to improve cost-effectiveness by identifying which components are most effective and thus warrant more monetary resources.

Sample size and treatment standardization. ReBoot programs will, by design, have a small number of participants. Thus, an appropriate avenue to increase the reliability and precision of a quantitative program evaluation would be to combine results across ReBoot programs. If results are to be combined, it is important to standardize treatments across programs. Standardization would also decrease the variability of data within a given ReBoot, and thus improve statistical power, even if results are not combined. For example, one could standardize the number of sessions and timing of sessions such that CRM, IBAM, EMDR, EAA, and BWO are offered in the same amount and same order to each participant. Standardization within modalities would also be beneficial. CRM, EMDR, and BWO are already standardized, and standardizing IBAM and EAA could be as simple as having operational definitions of each exercise and presenting all exercises in the same order for each camp. For EMDR and EAA, it would be useful to assess intervention integrity, or how well each therapist adhered to treatment principles and interventions in each session. In addition, standardized EMDR process notes could quantify how complete processing was for each participant at the end of ReBoot, perhaps by indicating the degree of processing completed for each memory, without need to specify the memory or the presenting issue.

Ongoing Research

Besides the quantitative results presented here, participants were given a qualitative interview designed to shed light on pre-treatment assessment scores and changes in scores from pre- to post-treatment and 3-month follow-up. In addition, at the 3-month follow-up, participants were provided a 3-day ReUnion program that included BWO, IBAM, and abbreviated EAA; the full battery of assessments was given at the end of ReUnion. Analysis of the qualitative interview, EEG data from BWO during both ReBoot and ReUnion programs, and the overall effect of the ReUnion experience will be presented elsewhere.

Conclusions

The five-day, resident ReBoot experience provided a non-stigmatizing and attractive venue to veterans who are often wary of treatment. The protocol, an integrative sequence of CRM, EMDR, EAA, IBAM, and BWO, provided cognitive, emotional, experiential, and physiological treatment of PTSD symptoms. At intake, nearly all participants reported clinically significant anxiety and depression; almost half reported dissociation typical of PTSD. During ReBoot, participants experienced large improvements in anxiety, depression, dissociative experiences, hope, and quality of life. At 3-month follow-up, improvement was maintained for depression, dissociative experiences, and hope, and was marginally significant for anxiety. Although limited by the lack of a control group and small sample size, and despite treatment modalities designed for use over longer periods, the ReBoot experience appears to be a powerful intervention for veterans with symptoms of PTSD.

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Table 1. Pre- and post-treatment assessment scores for 9 participants at a one-week, multi-modal treatment program for veterans with symptoms of PTSD. Statistical comparison based on two-tailed, paired t-tests.

Assessment	Before		After		Effect Size	Difference	
	\bar{x} (SD)	\bar{x} (SD)	\bar{x} (SD)	$\bar{x} \pm SE$		<i>t</i> -value	<i>p</i> -value
Hamilton Rating Scale for Anxiety	19.1 (8.3)	7.1 (5.1)	1.73	12.0 ± 2.9	4.12	0.003	
Hamilton Rating Scale for Depression	14.0 (8.0)	5.8 (6.0)	1.13	8.2 ± 2.6	3.13	0.01	
Dissociative Experiences Scale –II ^a	38.4 (24.0)	14.4 (18.9)	1.08	24.0 ± 6.8	3.51	0.01	
Hope Scale	39.4 (12.9)	46.4 (9.7)	0.59	7.0 ± 3.0	2.32	0.048	
Quality of Life Experiences & Satisfaction ^b	50.4 (21.3)	70.7 (16.2)	1.02	0.20 ± 0.05	4.36	0.002	

^aDES-II is based on 7 individuals. One individual did not complete the DES-II pre-treatment; a second individual did not complete the full DES-II form at post-treatment.

^bQuality of Life Experiences and Satisfaction Questionnaire – Short Form (QLES-Q-SF).

Table 2. Pre-treatment and 3-month follow-up assessment scores for 9 participants at a one-week, multi-modal treatment program for veterans with symptoms of PTSD. Statistical comparison based on two-tailed, paired t-tests.

Assessment	Before	3-month	Effect Size	Difference	<i>t</i> -value	<i>p</i> -value
	\bar{x} (SD)	\bar{x} (SD)		$\bar{x} \pm SE$		
Hamilton Rating Scale for Anxiety	17.6 (7.4)	13.0 (4.4)	0.72	4.5 ± 2.5	1.95	0.09
Hamilton Rating Scale for Depression	13.2 (8.3)	8.0 (5.2)	0.59	5.2 ± 1.6	3.28	0.01
Dissociative Experiences Scale –II ^a	40.4 (24.9)	20.3 (21.0)	0.88	20.1 ± 6.8	3.01	0.02
Hope Scale	40.5 (13.3)	52.6 (12.9)	0.93	12.1 ± 4.7	2.60	0.04
Quality of Life Experiences & Satisfaction ^b	53.3 (20.7)	59.1 (9.2)	0.34	0.06 ± 0.07	0.88	0.41

^aDES-II is based on 7 individuals. One individual did not complete the DES-II pre-treatment; a second individual could not be reached at follow-up.

^bQuality of Life Experiences and Satisfaction Questionnaire – Short Form (QLES-Q-SF).

Table 3. Comparison of pre- vs. post-treatment, and pre-treatment vs. 3-month follow-up scores on the DSM-5 Adult Level 1 Cross-Cutting Symptom Measure for 9 participants at a one-week, multi-modal treatment program for veterans with symptoms of PTSD. Positive differences indicate score improvement from pre-treatment. Statistical comparison based on two-tailed, paired t-tests.

Domain	Pre- vs. post-treatment			Pre-treatment vs. 3-mo follow-up		
	Difference			Difference		
	$\bar{x} \pm SE$	<i>t</i> -value	<i>p</i> -value	$\bar{x} \pm SE$	<i>t</i> -value	<i>p</i> -value
I. Depression	2.00 ± 0.37	5.37	<0.001	1.75 ± 0.31	5.58	<0.001
II. Anger	2.56 ± 0.47	5.38	<0.001	1.50 ± 0.50	3.00	0.02
III. Mania	0.33 ± 0.65	0.52	0.62	0.13 ± 0.52	0.24	0.81
IV. Anxiety	1.67 ± 0.47	3.54	0.008	1.50 ± 0.50	3.00	0.02
V. Somatic Symptoms	2.11 ± 0.42	4.99	0.001	2.13 ± 0.58	3.66	0.006
VI. Suicidal Ideation	0.44 ± 0.18	2.53	0.04	0.38 ± 0.18	2.05	0.07
VII. Psychosis	0.11 ± 0.11	1.00	0.35	0.13 ± 0.13	1.00	0.38
VIII. Sleep Problems	2.67 ± 0.44	6.05	<0.001	2.00 ± 0.42	4.73	0.001
IX. Memory	1.00 ± 0.33	3.00	0.02	1.00 ± 0.46	2.16	0.06
X. Repetitive Thoughts & Behaviors	0.78 ± 0.43	1.79	0.11	1.13 ± 0.52	2.18	0.06
XI. Dissociation	0.67 ± 0.29	2.31	0.05	0.75 ± 0.37	2.05	0.07
XII. Personality Functioning	1.00 ± 0.41	2.45	0.04	1.13 ± 0.52	2.18	0.06
XIII. Substance Use	0.78 ± 0.40	1.94	0.09	0.50 ± 0.33	1.53	0.17

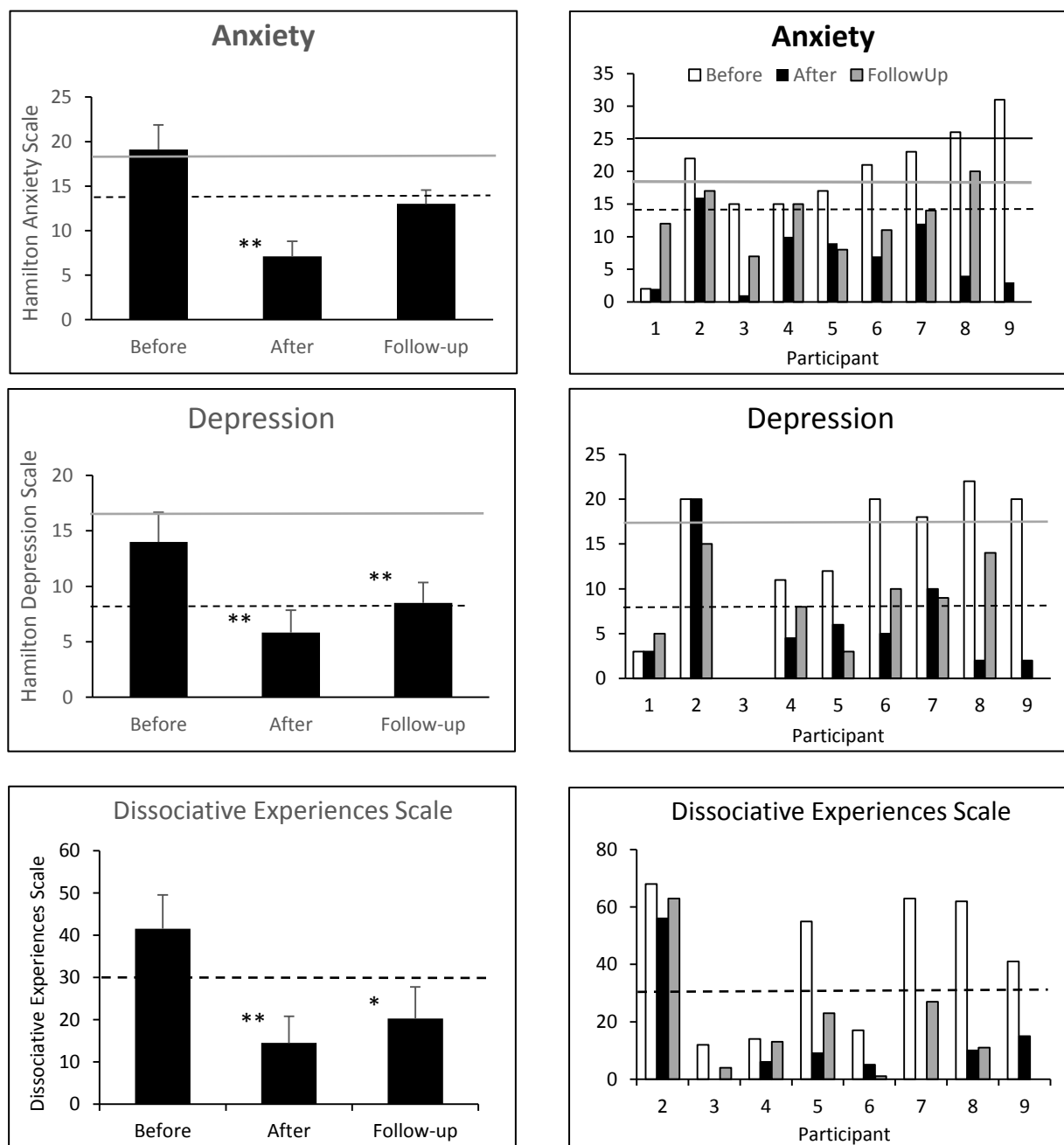


Figure 1. Mean scores (and SE bars) on Hamilton Anxiety Scale, Hamilton Depression Scale, and Dissociative Experiences Scale-II, before and after ReBoot ($N = 9$), and at 3-month follow-up ($N = 8$). For anxiety and depression, dashed, gray, and black lines indicate mild, moderate, and severe symptoms, respectively. For DES-II, dashed line indicates typical score of individuals with PTSD. Asterisks indicate mean scores significantly different than before ReBoot (* $p < 0.05$; ** $p \leq 0.01$).

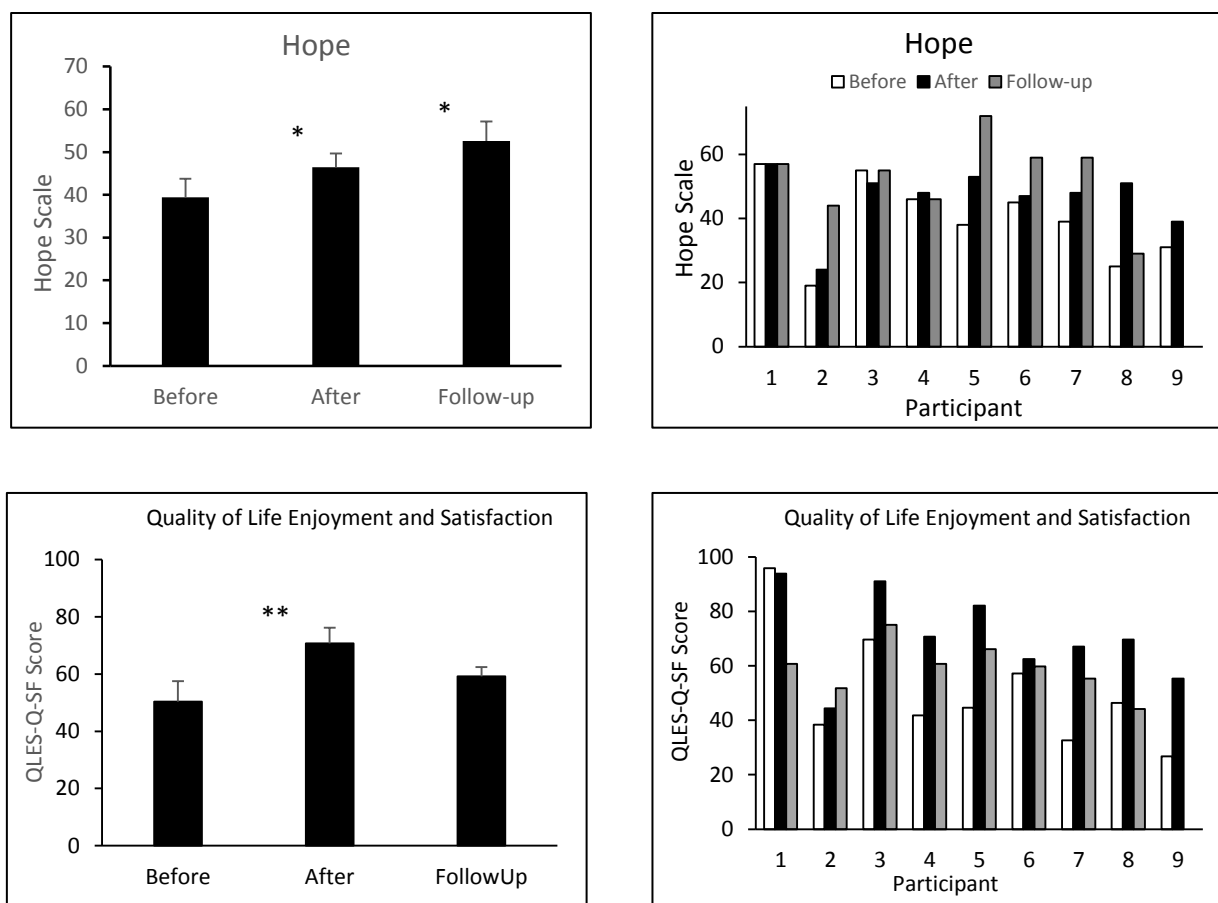


Figure 2. Mean scores (and SE bars) on Hope Scale and the Quality of Life Experiences and Satisfaction Questionnaire – Short Form (QLES-Q-SF), before and after ReBoot ($N = 9$), and at 3-month follow-up ($N = 8$). Asterisks indicate mean scores significantly different than before ReBoot (* $p < 0.05$; ** $p \leq 0.01$).

Appendix A

Literature Review of Equine-Assisted Psychotherapy and Mindfulness-based Interventions

Effectiveness of Equine-Assisted Psychotherapy

Children and adolescents. Quantitative studies in peer-reviewed journals, summarized below, show promise for EAP as an adjunctive treatment for children and adolescents recovering from intra-family violence (Schultz et al., 2007), sexual abuse (Kemp et al., 2014; Signal et al., 2013), PTSD symptoms (McCullough et al., 2015), emotional disorders (Holmes, et al., 2012), and for youth at-risk (Bachi et al., 2012; Trotter et al., 2008). Most studies reviewed in this Appendix had sample sizes less than 17; exceptions are noted.

In 63 children who had experienced intra-family violence and presented with a variety of disorders, Schultz et al. (2007) found that Global Assessment of Functioning (GAF) scores improved significant from pre-to post-treatment, and degree of improvement was positively correlated with number of sessions attended. Children who had a history of physical abuse or neglect showed more improvement than those who did not. Similarly, in a study of children and adolescents who had been sexually abused ($N = 30$), participants improved significantly across symptoms of depression, anxiety, and PTSD after nine weeks of EAP, whereas they had not improvement in the previous six weeks of traditional, in-clinic cognitive behavioral therapy (Kemp et al., 2014; Signal et al., 2013). Among youth with PTSD symptomology, pre- to post-EFT assessments indicated a statistically significant decrease in PTSD symptoms (McCullough et al., 2015).

In a study of at-risk children and adolescents, those receiving equine-assisted counseling ($n = 126$) showed significant improvement in positive and negative behavioral scores, and improved significantly more in 7 of 16 behavioral areas than those receiving traditional

classroom group counseling ($n = 38$) (Trotter et al., 2008). In a study of adolescents with emotional difficulties, equine-assisted activity resulted in significant reduction in trait anxiety but no increase in self-esteem (Holmes et al., 2012). Among adolescents in an Israeli residential treatment facility, those who received seven months of weekly EAP ($n = 14$) showed improved scores on self-image, self-control, trust, and life satisfaction, but results were not statistically significantly different from the control group ($n = 15$) (Bachi et al., 2012).

Adults. EAP as a treatment of trauma in adults is less well researched, but quantitative studies indicate that the ground-based EAP model is a promising approach for adults recovering from sexual abuse (Signal et al., 2013), intimate partner violence (Whittlesey-Jerome, 2014), catastrophic loss (Graham, 2007), and PTSD (Earles, et al., 2015; EAVS, 2013).

In a study of women survivors of childhood sexual abuse, nine weeks of EAP resulted in a significant reduction in depressive symptoms, whereas there had been no improvement in the previous six weeks of traditional, in-clinic cognitive behavioral therapy (Signal et al., 2013). Among women in abusive relationships who sought treatment, a comparison of EAP to a treatment-as-usual control group (group therapy and domestic violence services), found that both groups improved from pre- to post-treatment in self-efficacy, depression, anxiety, and general functioning, but the EAP group did not improve significantly more than the control group (Whittlesey-Jerome, 2014). Among women who had experienced a catastrophic loss within the past two years, equine activities facilitated by a horse specialist resulted in a significant decrease in depression and increase in mental wellness compared to a control group ($N = 16$ in each; Graham, 2007). Among clients with PTSD symptoms, six weekly sessions of EAP was associated with a reduction in PTSD symptoms, emotional responses to trauma, anxiety, depression, and alcohol use, and an increase in mindfulness strategies, but no significant

improvement in proactive coping, self-efficacy, life satisfaction, or physical health (Earles et al., 2015).

EAP has also been effective in reducing aggression in psychiatric inpatients (Nurenberg et al., 2014), and for reducing stress and improving well-being in a neurotypic population (Klontz, Bivens, Leinart, & Klontz, 2007). In a well-designed, randomized study comparing compared EAP to canine-assisted therapy, social skills enhancement group therapy, and regular psychiatric hospital care, Nurenberg et al. (2014) assigned 90 patients diagnosed with a severe and persistent mental illness and exhibiting high aggression to one of the four groups. EAP reduced aggressive incidents significantly more than the other treatments based on standardized staff measures for two months pre-intervention and three months post-intervention. Klontz et al. (2007) found that 31 neurotypic participants provided EAP reported significant reductions in psychological distress and improvements in well-being from pre- to post-treatment and the change was stable at 6-month follow-up.

Effectiveness of Yoga and Mindfulness in Treating Trauma

Yoga. In a RCT of veterans with PTSD, a group that practiced Sudarshan Kriya yoga, a breathing-based meditation, for 21 hours over 7 days, was compared to a control. The yoga group showed reduced PTSD scores, anxiety scores, and respiration rate, but the control group did not ($N = 21$; Seppälä et al., 2014). Non-RCT studies also support the value of yoga for reduction of PTSD symptoms in veterans. A 6-week, biweekly, yoga program improved hyperarousal symptoms of PTSD, sleep quality, and daytime dysfunction related to loss of sleep, but did not improve total PTSD symptoms, anger, and quality of life ($N = 12$; Staples et al., 2013). A 5-day yoga program, including breathing, body scan, and stretching exercises, reduced

PTSD symptoms in Vietnam veterans in Australia significantly more than a waitlist treatment, and gains were maintained at 6-month follow-up (non-RCT, $N = 26$, Carter et al., 2013).

MBSR, mindfulness, and meditation. Three RCTs with moderate to large sample sizes had mixed results in using MBSR to treat PTSD and depression in veterans. In one study, MBSR, compared to treatment-as-usual, had no reliable effect on PTSD or depression, but appeared to improve mental health-related quality of life scores ($N = 47$; Kearney, McDermott, et al., 2013). For those who completed at least 4 sessions of MBSR, there were medium to large between-group effect sizes for depression, mental health-related quality of life, and mindfulness skills. In a similar study, MBSR plus treatment-as-usual, compared to a control treatment-as-usual, produced significant decreases in chronic fatigue, pain, cognitive failures, and depression at 6-month follow-up ($N = 55$; Kearney et al., 2015). PTSD symptoms had decreased at post-treatment but not at 6-month follow-up. And finally, in a large RCT that compared two types of mindfulness activities (body scan; mindful breathing) to two types of controls (sitting quietly; slow breathing), the mindfulness groups had significant decreases in PTSD symptoms and depression, and an increase in mindfulness, while the control groups did not ($N = 102$; Colgan et al., 2016).

Several non-RCTs provide support for MBSR and meditation in treating PTSD. In a longitudinal study of 92 veterans who had participated in an 8-week MBSR group in addition to treatment-as-usual at a VA hospital, participants had significantly improved in PTSD symptoms, depression, behavioral activation, acceptance, mindfulness, and the mental component of the SF-8 at six months after enrollment (Kearney et al., 2012). In a pilot study of loving-kindness meditation, Kearney, Malte, et al. (2013) provided a 12-week loving-kindness meditation training, in addition to treatment-as-usual at a VA hospital, to 42 veterans with PTSD. In loving-

kindness meditation, participants repeat phrases of positive intentions for self and others. At 3-month follow-up, medium to large effect size were noted for PTSD, depression, mindfulness, and self-compassion. Self-compassion appeared to mediate the improvement in PTSD and depression. Similarly, in a correlative study, mindfulness and self-compassion were each uniquely and negatively associated with PTSD symptom severity in returning Gulf War veterans (Dahm et al., 2015).

APPENDIX B

Equine-Assisted Activities at ReBoot

Equine-assisted activities at ReBoot included: *Making Contact*; *Join-up*; *Stepping Together*; *Grooming and Care-giving*; and the *Grief Release Walk*. In *Making Contact*, the participant and Equine Specialist (ES) watched the behavior of horses in the herd, allowing the participant an opportunity to relate human emotions to the horse's behavior. The ES provided psychoeducation about how the horse will respond to a human entering the arena and general instructions about how to approach and work with horses. The participant and ES together chose a horse with which the participant wished to work. The participant, with help from the ES, approached a horse and led it into the arena. Concepts of safety, trust, leadership, confidence, and boundaries of horse and participant were emphasized.

Join-Up is designed to teach the concept of gaining trust and exhibiting leadership through consistency and strength rather than dominance. Often the participant experiences acceptance, competence, and confidence. The participant stands in the center of the arena where a whip and halter have been placed on the ground, and the horse is released into the arena. The participant's goal is to move the horse in one direction for several rounds, not allowing the horse to slow below a trot and not allowing the horse to change directions. If the participant chooses to move the horse to the left, the participant's left hand is held above his/her head with fingers pointing to the left; the whip is held low and in the right hand. While holding this position in a single plane parallel to the horse's body, and while maintaining eye contact with the horse, the participant rotates in a small circle in the middle of the arena as the horse trots around its exterior. The horse often exhibits some form of rebellion, such as head-throwing, and may attempt to stop or change direction. The participant decides when to reverse the horse's direction around the arena, optimally after the horse is compliant with the first direction and before they

exhibit boredom. The horse is not allowed to choose the timing of the reversal. To change direction to the right, the participant moves the whip to the left hand and places the right arm above his/her head with fingers pointing to the right. After several rounds and direction changes, the horse begins consistently orienting its neck and head towards the participant while trotting, maintaining eye contact, and attempting to move in smaller, tighter circles. At this point, the participant drops the whip and turns his/her back to the horse. The horse inevitably moves to reinitiate contact by approaching the participant's back, typically licking its lips as an indication of submission, and often nudges the participant with its head. The participant then turns to the horse, placing his/her arm around its neck, and placing the halter on the horse. The ES helps the participant to understand the horse's behavior as initially indicating fear or confusion, then seeing the participant as a strong leader when he/she becomes consistent and firm in directions, and as a result, "softening" or beginning to trust the participant and wanting to be near the participant.

In *Stepping Together*, rubber mats were placed in the arena and the participant encouraged the horse to step on, rather than over, the mats. Discussion focused on how the horse responded to the participant's body language, pressure on the halter, voice commands, and tone of voice. In *Grooming and Care-Giving*, the participant was asked to experience how the horse responded to their touch and voice, their own response to physical contact with the horse, and the reciprocity of the horse and participant each initiating contact and approach. In the *Grief Release Walk* is designed to deepen the processing of emotion that has begun either through EMDR, EAP, or other modalities. It occurs after the participant has formed a bond with a horse. The participant is encouraged to talk to, and otherwise communicate with, the horse during an extended, open-ended walk outside of the corrals, along the road or other paths.