The Effectiveness of Trauma-Informed Wilderness Therapy With Adolescents:

A Pilot Study of New Vision Wilderness Therapy

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Disclaimer

The views expressed in this clinical dissertation manuscript are those of the student and do not necessarily express the views of the Wheaton College Graduate School.

Abstract

Youth with complex trauma comprise one of the most distressed and difficult-to-treat populations for clinicians (Complex Trauma Task Force, 2003; Luxenberg et al., 2001a). Wilderness therapy is a growing area of interest for the treatment of at-risk youth (Bowen et al., 2016; Russell, 2001). Nevertheless, the effectiveness of wilderness therapy for youth with complex trauma has yet to be evaluated empirically. This manuscript presents an evaluation of a trauma-informed wilderness therapy program, New Vision Wilderness Therapy (NVWT). Between 2009 and 2019, 816 adolescents (ages 13–17, M_{age} = 15.36, *SD* = 1.25; 41.1% female) completed the Youth-Outcome Questionnaire–SR 2.0 at intake and discharge (*M* = 75.02 days, *SD* = 28.77). Additionally, 253 adolescents completed two 2.5-minute segments of heart-rate-variability biofeedback (one while resting and one while engaging in a coping skill). Between 25 and 99 adolescents and caregivers also completed psychological and family measures at 6-months and 1-year postdischarge. Adolescents reported experiencing improvements in psychological functioning. They also exhibited improvement in psychophysiological functioning (heart-rhythm coherence). Caregivers reported improvements in their child's psychological functioning. Caregivers also observed more persisting benefits in their child's psychological functioning when compared to adolescent self-report. There were very few differential effects on the basis of demographic factors, trauma exposure, or past and current treatment factors. Results of this pilot study suggest NVWT is a promising intervention for improving the psychological and psychophysiological functioning of complexly traumatized adolescents.

Keywords: wilderness therapy, trauma, adolescents, effectiveness, biofeedback

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Wilderness therapy (WT) refers to the provision of psychological service in an outdoor setting (Davis-Berman & Berman, 1994; Russell, 2001). Scholarly interest in WT has increased considerably over the past decade, but most of this research has been theoretical. The little empirical research that exists on WT has tended to focus on at-risk youth. The purpose of the current study is to evaluate the effectiveness of New Vision Wilderness Therapy (NVWT), a specific form of WT that uses an immersive relational model. NVWT is grounded in attachment, neuroscience, and trauma research. Treatment focuses on developing healing relationships between WT participants and staff. These relationships are thought to be a primary catalyst for psychological and physiological change.

Review of the Literature

Definition of Terms

Wilderness-Therapy-Related Terms

Davis-Berman and Berman (1994) defined WT as "the use of traditional therapy techniques, especially for group therapy, in an out-of-doors setting, utilizing outdoor adventure pursuits and other activities to enhance personal growth" (p. 13). According to Davis-Berman and Berman, WT also requires the implementation of psychotherapeutic elements such as clinical assessment and treatment planning provided by a licensed professional (Davis-Berman & Berman, 1994). Elsewhere, Russell (2001) reviewed commonalities among various WT approaches. His integrated definition of WT contains

four core components: (a) a therapeutic basis, (b) clinical assessment and treatment planning, (c) provision of services by qualified professionals, and (d) aftercare planning at termination (Russell, 2001).

WT programs fall under the broad umbrella of *wilderness experience programs* (WEPs), or "organizations that conduct outdoor programs in wilderness or comparable lands for purposes of personal growth, therapy, rehabilitation, education or leadership/organizational development" (Friese et al., 2016, p. 40). WT remains unique among WEPs in that WT programs offer psychotherapy and other psychological services in a systematic manner. WT programs also focus on clinical and at-risk populations, whereas WEPs are available to a broader and often nonclinical population (Davis-Berman & Berman, 1994; Hill, 2007; Russell, 2001). Furthermore, WT is distinct from *adventure therapy*, which refers to the prescribed use of "adventure experiences" such as ropes courses and trust-building activities for therapeutic purposes (Bowen & Neill, 2013). Adventure therapy does not necessarily occur in the outdoors (whereas WT does). However, WT programs nearly always utilize adventure therapy (Bowen & Neill, 2013; Russell, 2001).

Coherence-Related Terms

Trauma disrupts coherence across many domains of functioning (McCraty & Zayas, 2014; Siegel, 2012). Generally speaking, the term *coherence* refers to "the fluid and adaptive flow of integrated elements across time" (Siegel, 2012, p. 439). McCraty et al. (2009) described *psychophysiological coherence* (interchangeably called *heart coherence*) as "characterized by increased synchronization, harmony, and efficiency in

the interactions within and among the physiological, cognitive, and emotional systems" (p. 15). In coherent states, heart rhythms are smooth and sine wavelike, the branches of the autonomic system (ANS) are in sync, and the parasympathetic nervous system (PNS) is active. Moreover, coherence is associated with improvements in cognitive, psychological, and physical health (Edwards, 2015; McCraty & Tomasino, 2004). Conversely, *psychophysiological incoherence* is characterized by erratic and variable heart rhythms and unsynchronized ANS branches. If maintained in the long term, incoherent psychophysiological states cause the nervous system to become exhausted (McCraty et al., 2009; McCraty & Zayas, 2014).

Trauma-Related Terms

According to the *Diagnostic and Statistical Manual of Mental Disorders–5* (*DSM-5*), the term *trauma* refers to "exposure to actual or threatened death, serious injury, or sexual violence" (American Psychiatric Association, 2013, p. 271). This trauma may be either witnessed or experienced firsthand (American Psychiatric Association, 2013).

Posttraumatic Stress Disorder. Criterion A for posttraumatic stress disorder (PTSD) requires the presence of trauma (American Psychiatric Association, 2013). Subsequent criteria delineate associated symptoms, which must be present for more than 1 month to meet diagnostic requirements. These symptoms include (a) intrusion symptoms, (b) avoidance behaviors, (c) negative alterations in mood or cognition, and (d) negative changes in arousal and reactivity (American Psychiatric Association, 2013).

Impairment in occupation, relationships, and other domains of functioning occur as a result of these symptoms (Criterion F; American Psychiatric Association, 2013).

Complex Trauma. The construct *complex trauma* evolved from recognition that PTSD criteria do not encapsulate the experience of ongoing interpersonal trauma (Cook et al., 2005; Peterson, 2018). Complex trauma is dual in nature, referring to both the experience of repeated interpersonal trauma (typically in caregiving relationships) and the adaptation to these experiences (Cook et al., 2005; Spinazzola et al., 2005, 2013). In complex trauma, the *DSM-5* definition of trauma is extended to include experiences such as emotional abuse, attachment disruptions, and separation from caregivers (Cook et al., 2005; Spinazzola et al., 2005, 2013). Moreover, the psychological consequences of complex trauma do not fit neatly into *DSM-5* criteria for PTSD (Cloitre et al., 2009). Rather, complex trauma deleteriously impacts the following domains: interpersonal relationships, attention and consciousness, executive functioning, personality, and systems of meaning (Cloitre et al., 2009; D'Andrea et al., 2012; Luxenberg et al., 2001a; van der Kolk et al., 2005). The sequelae of complex trauma are understood as adaptations to repeated harm (Cook et al., 2005; Spinazzola et al., 2005, 2013). The diagnostic framework of developmental trauma disorder (DTD) has been proposed to provide a more formal nosology of complex trauma (D'Andrea et al., 2012; Spinazzola et al., 2018).

Complex Trauma in Youth

Youth with complex trauma are particularly well-suited for WT programs. Complex trauma's physiological impact aligns well with the treatment targets of WT.

Given this, the current study proposed that trauma-informed wilderness therapy (TIWT) may serve to increase psychophysiological coherence in complexly traumatized youth. To understand the appropriateness of WT for complex trauma treatment, an understanding of complex trauma and its traditional treatments is first necessary.

Theory

The construct of complex trauma is theoretically grounded in attachment theory. Attachment theory proposes that humans are innately driven to seek connection to others (Ainsworth, 1967; Bowlby, 1969, 1973; Bowlby et al., 1993; Bretherton, 1992). John Bowlby (1969, 1973) theorized that the most fundamental of these connections is the early relationships between child and caregivers, which are eventually organized into internal working models (Bowlby, 1969; Charuvastra & Cloitre, 2008). Mary Ainsworth's (1967) Strange Situation experiment expanded upon Bowlby's (1969) theory by categorizing infant attachment into three distinct patterns: (a) secure attachment (i.e., an infant able to navigate life independently and connect with others); (b) insecure-avoidant attachment (i.e., avoidance toward caregiver); and (c) insecure-ambivalent attachment (i.e., anxious preoccupation toward caregiver). However, perhaps most relevant to the discussion of complex trauma is Main's (1996) identification of *disorganized attachment*, which represents erratic behavior in response to separation and reunion with the caregiver. Disorganized attachment most often results from frightening caregiving. According to Main (1996), when a caregiver represents threat, the child is placed in a behavioral paradox; he or she is unable to approach, avoid, or flee the caregiver. Consequently, a "collapse of behavioral strategy" ensues (Main, 1996, p. 239).

Attachment theory's acknowledgement of the human need for connection, and the damage resulting from neglectful or harmful caregiving, informs the social aspects of trauma long recognized by the field (Charuvastra & Cloitre, 2008; Herman, 1992).

Research

Complex trauma is associated with disorganized attachment. This association is readily apparent in that maltreatment normatively involves frightening or traumatizing caregiving. Extensive empirical support indicates that individuals with early maltreatment experience emotional and behavioral challenges, substance use, and increased risk for repeated trauma exposure (D'Andrea et al., 2012; Luxenberg et al., 2001a). Many of these outcomes are attributed to trauma's profound impact on brain development and nervous system functioning (Perry, 2009; Porges, 2017; van der Kolk, 2002, 2015).

Physiological Impacts of Trauma

Maltreatment severely impacts brain development because the brain normatively develops in a "bottom up" manner. In other words, more primitive brain regions (located nearer to the brainstem and involved in more basic physical and affective processing) are developed at birth, whereas cortical brain regions (located on the outside of the brain and involved in higher order cognitive functioning) are the last to develop (Perry, 2009; Siegel, 2012; van der Kolk, 2015). Brain development is reliant upon experience, and responsive, loving caregiving in particular (Perry, 2009; Siegel, 2012). When children are maltreated at an early age, infants fail to develop the brain circuits necessary to respond appropriately to stress and to connect to others (Perry, 2009; Siegel, 2012; van der Kolk, 2015).

Trauma also impacts the body's stress response systems. In the presence of threat, the stress response system signals the brain to release chemicals and stress hormones throughout the body. The sympathetic nervous system raises heart rate, increases respiration, and prepares the body to escape or retaliate—a state commonly referred to as *fight-or-flight* (Loman & Gunnar, 2010; The National Scientific Council on the Developing Child, 2014). Healthy stress response systems develop when caregivers aid the infant in calming and coping. Alternatively, harmful caregiving results in an ongoing stress response, with no parental buffer to aid the infant in calming. As a result, the youth's stress response thresholds are lowered and hypervigalence can occur (Gunnar & Cheatham, 2003; Loman & Gunnar, 2010; The National Scientific Council on the Developing Child, 2014). When unable to fight or flee, the *freeze* system, a more primitive system, is recruited. In the freeze state, the dorsal vagal circuit (DVC) is active. Heart rate declines and breathing slows to the extent that one becomes immobile. The body is also unable to oxygenate blood and unconsciousness can occur (Porges, 2003, 2007, 2017; van der Kolk, 2015). Chronic activation of the body's stress response systems is associated with a number of health concerns, including increased risk of cardiovascular disease, developmental delays, cancer, and substance abuse (Center on the Developing Child at Harvard University, 2010; Felitti et al., 1998; The National Scientific Council on the Developing Child, 2014).

Psychophysiological Coherence and Trauma. Elsewhere, the concept of *psychophysiological coherence* illuminates the physiological fragmentation that results from complex trauma. Research notes the ways trauma disrupts psychophysiological

coherence. For instance, soldiers diagnosed with PTSD have shown to have lower levels of both coherence and heart rate variability (HRV) than controls (i.e., soldiers who do not meet criteria for PTSD; Ginsberg et al., 2010). According to McCraty and Zayas (2014), the traumatized body's "set point" is such that all sensory input is referenced against the trauma. These set points leave the survivor stuck in familiar patterns that are mediated by the ANS (e.g., chronic state of hyperarousal). Developing comprehensive treatments that address this incoherence has been a central task for the complex trauma field to date (van der Kolk, 2002, 2015).

Practice

Evidence-Based Treatments for PTSD in Youth

To date, the American Psychological Association (APA) has not developed guidelines for the treatment of PTSD in youth. However, a practice parameter by Cohen et al. (2010) suggested that treatment should involve multiple systems of care, trauma processing, caregiver inclusion, and an emphasis on enhancing functioning. Dorsey et al.'s (2017) review updated the evidence base for psychosocial treatment of PTSD in children and adolescents. Thirty-seven studies were examined for methodological rigor, and each treatment was designated a level of support. *Well-established* interventions were individual and group cognitive-behavioral therapy (CBT), including trauma-focused cognitive behavior therapy (TF-CBT). *Probably efficacious* treatments were group CBT with parent involvement and eye movement desensitization and reprocessing (EMDR); whereas, individual integrated therapy for complex trauma and group mind-body skills were categorized as *possibly efficacious*. Last, individual client-centered play therapy,

individual mind-body skills, and individual psychoanalysis were deemed *experimental*; and group creative expressive + CBT was deemed *questionable efficacy*. Leaders in the field of complex trauma have expressed concern that many of these treatments are more effective for "pure" forms of PTSD and do not address the unique needs of complexly traumatized individuals (van der Kolk, 2002, 2015). Although exposure therapy or CBT may be a component of treatment, the demands of complex trauma often require a unique treatment approach.

Emerging Best Practices for Treatment of Complex Trauma

The symptom profile for complex trauma is diverse, leading to variations in treatment trajectory (Cloitre et al., 2009; Courtois, 2008; D'Andrea et al., 2012; Lawson & Quinn, 2013). Cloitre et al.'s (2009) survey of 25 trauma experts was influential in forming best practices for complex trauma treatment. The survey offered unanimous support for treatment that emphasizes several core components, including emotion regulation skills, trauma-focused interventions, and strengths-based interventions (Cloitre et al., 2011, 2012). Additionally, Cloitre et al.'s (2011, 2012) survey supported Herman's (1998) phase-based, multimodal approach to treatment. Herman (1998) suggested the following phases of complex trauma treatment: (a) Phase 1 includes safety, stabilization, and the development of a working relationship; (b) Phase 2 involves trauma processing and the construction of a coherent trauma narrative; and (c) Phase 3 is reintegration with the world through relationship, work, and community involvement. Recently, the International Society for Traumatic Stress Studies (ISTSS) released a position statement on complex trauma in children and adolescents (ISTSS Guidelines Committee, 2019).

The paper indicated that many of the domains associated with complex trauma may overlap with other childhood disorders, and that assessment must proceed carefully as a result. Additionally, the ISTSS proposed that no one treatment can be recommended for complex trauma, but that common treatments, such as TF-CBT, may be somewhat effective (ISTSS Guidelines Committee, 2019). However, many experts in the field of complex trauma suggest that a unique, multimodal approach, similar to that of Cloitre et al.'s (2009) and Herman's (1998), is required to treat ongoing relational harm in youth (Cloitre et al., 2009; Courtois, 2008; D'Andrea et al., 2012; Lawson & Quinn, 2013).

Interventions for Youth Exposed to Complex Trauma

Attachment, Self-Regulation, and Competency

Attachment, Self-Regulation, and Competency (ARC) is a component-based framework developed to address the sequelae of complex trauma in youth (Blaustein & Kinniburgh, 2010, 2017). The intervention is comprised of three domains and 10 treatment targets (or building blocks): (a) Attachment (building blocks include caregiver affect management, attunement, effective response); (b) Regulation (comprised of affect identification, modulation, and expression); and (c) Competency (including executive functioning skills and identity formation). Woven throughout these domains are the foundational targets of engagement, psychoeducation, and routines and rituals. A final domain, the Trauma Experience Integration, aids the child in developing an integrated life narrative and present-moment awareness (Blaustein & Kinniburgh, 2010, 2017; Kinniburgh et al., 2005). ARC boasts a considerable amount of empirical support. The framework has proven effective at reducing posttraumatic stress symptoms, emotional

concerns, and behavioral problems in children and adolescents (Arvidson et al., 2011; Bartlett et al., 2018; Ford & Blaustein, 2013; Hodgdon et al., 2013, 2016).

Trauma Affect Regulation: Guide for Education and Therapy

Trauma Affect Regulation: Guide for Education and Therapy (TARGET) is a neurobiologically based intervention that provides clients with an accessible model of the body's trauma response and steps for skill building (Ford, 2015, 2017). Clients are first given psychoeducation regarding PTSD symptoms and trauma's impact on the brain (Ford, 2015). Cognitive skills, or FREEDOM skills, are then taught (Ford, 2015). Underlying FREEDOM skills is the meta-skill of *focus*, which is divided into three substeps: Slow down, Orient, Self-check (SOS; Ford, 2015). The FREEDOM and SOS skills provide the client with a toolkit for responding to trauma symptoms, and a creative art component (i.e., writing, drawing) aids the client in creating a cohesive life narrative (Ford, 2015). TARGET was developed and researched first in adult populations, but growing evidence supports its use with youth (Ford, 2015). The intervention has shown to be effective in reducing psychological distress (i.e., intrusive reexperiencing, avoidance, anxiety), decreasing disciplinary incidents and seclusions, reducing recidivism, and increasing emotion regulation in juvenile justice settings (Ford & Hawke, 2012; Ford et al., 2012).

Structured Psychotherapy for Adolescents Responding to Traumatic Stress

Structured Psychotherapy for Adolescents Responding to Chronic Stress (SPARCS) is a 16-week manualized group therapy intervention for adolescents with complex trauma. The intervention targets six domains impacted by trauma: affect

regulation, attention and consciousness, impulsivity, self-perception, systems of meaning, and relationships. Notably, SPARCS emphasizes mindfulness, coping strategies, and interpersonal skills rather than direct trauma processing. To this end, SPARCS draws upon dialectical behavior therapy for adolescents (DBT), TARGET, and trauma and grief component therapy for adolescents. The goals of treatment are captured by the "Four C's": Cultivating Awareness, Coping Effectively, Connecting With Others, and Creating Meaning. Preliminary research indicates that SPARCS is effective in decreasing PTSD symptoms, avoidance, reexperiencing, and hyperarousal symptoms, as well as increasing daily functioning (National Child Traumatic Stress Network, 2008; Weiner et al., 2009).

PTSD Treatments Adapted for Youth With Complex Trauma

Two PTSD treatments, TF-CBT and EMDR, have been adapted for youth with complex trauma. Cohen et al. (2012) described an adaption of TF-CBT similar to the phase-based approach described in complex trauma literature. More significant time is allotted for developing coping skills and for treatment closure and consolidation (Cohen et al., 2011, 2012). Adapted TF-CBT also considers Enhancing Safety skills a frontline intervention, and the trauma narrative focuses on "trauma themes" rather than events (Cohen et al., 2011, 2012). With these adaptions, TF-CBT has proven effective in reducing trauma symptoms, behavioral concerns, and emotional distress in foster care youth (Weiner et al., 2009).

Shapiro et al. (2017) described an EMDR modification suitable for youth with complex trauma. The modification includes extending the preparation phase of treatment and including the youth's family in preparation activities. The Safe Place exercise is

altered so that the client may develop a feeling of safety in treatment, rather than recalling a specific memory (Shapiro et al., 2017). A paucity of empirical evidence exists for the use of EMDR with complex-trauma-exposed youth. One study of 14 sexually abused Iranian girls (ages 12 to 13) indicated that EMDR is as effective as CBT in reducing PTSD symptoms and behavior problems, and these results were obtained more quickly than in CBT (Jaberghaderi et al., 2004).

Alternative Psychotherapeutic Treatments for Trauma-Exposed Youth

In the past few decades, there has been increasing interest in alternative, adjunctive treatments for trauma (Gurda, 2015; Kempson, 2007; Solomon & Heide, 2005). These treatments do not exclusively require verbal processing, but rather target the nervous system (van der Kolk, 2015). Following an examination of alternative approaches for youth, we will now examine WT, an intervention that may regulate traumatized psychophysiology through outdoor immersion.

Sensory Motor Arousal Regulation Treatment

Sensory Motor Arousal Regulation Treatment (SMART) was developed by a team of trauma therapists, occupational therapists, and sensory integration experts (Warner et al., 2013, 2014). The treatment was designed to enhance psychotherapy by directly targeting the vestibular, proprioceptive, and tactile systems (Warner et al., 2013). Office furniture is removed from the SMART room, a gym mat is placed on the floor, and equipment, such as large pillows and small trampolines, are provided for the client (Warner et al., 2013). Therapists attune with and track the client's bodily experiences in order to increase the client's somatic awareness and regulation capacity. Videotape is a

central tool for assessment, treatment planning, supervision, and consultation in SMART (Warner et al., 2013, 2014). A quasi-experimental study indicated that SMART leads to significant decreases in internalizing symptoms, somatic complaints, anxiety, hyperarousal symptoms, and depression when compared to treatment as usual (TAU; Warner et al., 2014).

Trauma Center Trauma Sensitive Yoga

Trauma Center at Justice Resource Institute (JRI) in Brookline, Massachusetts, developed Trauma Center Trauma Sensitive Yoga (TCTSY) in order to address the needs of complex trauma specifically (Emerson, 2015). This approach can be utilized in both individual and group sessions and focuses on cultivating skills in mindfulness, safety evaluation, and bodily awareness. Facilitators are careful to create a nonjudgmental environment through using noncoercive language. Unlike recreational yoga classes, mirrors are not typically used in trauma sensitive yoga, and participants create "forms" rather than "poses" (Emerson, 2015; Emerson et al., 2009). The mechanism of change in TCTSY is interoception, or "the visceral experience of feeling something in ... [the body]; the motivation to act that the visceral feeling may initiate; and the effect of … [the] visceral experience on ... mood and emotions" (Emerson, 2015, p. 45). The model posits that increased interoception allows for the processing of somatically held traumas (Emerson, 2015). TCTSY has been shown to improve self-care skills, posttraumatic stress symptoms, somatic complaints, and depression in adult trauma survivors (Rhodes, 2015). Although further evaluation of TSTCY for complex trauma in youth is needed,

The Trauma Center at JRI has effectively implemented TSTCY in three adolescent and young adult programs (Spinazzola et al., 2011).

BrainSpotting

BrainSpotting is a relatively new intervention that seeks to reprocess traumatic memories and their somatic impacts. BrainSpotting requires the client to hold a certain eye position while attuning with the clinician and verbally processing traumatic events. These "Brainspots" are thought to access the autonomic system and limbic system directly (Corrigan & Grand, 2013; Kaufman, 2015). Accessing the Brainspot and processing the traumatic experiences allow the trauma to be integrated more completely (Corrigan & Grand, 2013; Kaufman, 2015). Support for BrainSpotting is mostly anecdotal (Kaufman, 2015). Few studies of BrainSpotting exist, and as of yet, there are no published peer-reviewed studies of the intervention. Yet, approximately 8,000 clinicians have been formally trained in the intervention and presumably now use it to treat their trauma-exposed clients (Corrigan & Grand, 2013; Kaufman, 2015).

Heart Rate Variability Monitoring

One promising somatically based alternative intervention involves HRV monitoring. The HeartMath Institute has developed the emWave and Freeze-Framer HRV monitoring computer systems to build psychophysiological coherence. Using these systems, clients are able to watch HRV changes as they practice coherence-building techniques (e.g., mindfulness-based skills; McCraty & Tomasino, 2004). In educational settings, HeartMath has shown to be effective in reducing stress, anxiety, emotional disturbances, and symptoms of attention-deficit/hyperactivity disorder (ADHD) in

children (Aritzeta et al., 2017; Devi & Sheehy, 2013; Lloyd et al., 2010; Rush et al., 2017). Devi and Sheehy (2013) indicated that children as young as 5 and 6 years old are able to use and benefit from HeartMath techniques.

Wilderness Therapy

WT programs are a relatively new area of clinical interest. These programs integrate traditional treatment and alterative interventions in a natural setting (Christensen, 2008; Davis-Berman & Berman, 1994; Russell, 2001). WT's unique formatting and interventions may very well aid in treating the unique needs of complexly traumatized youth.

Format of Wilderness Therapy Programs

Treatment in WT typically occurs in groups, with an average of six clients and three leaders (Russell, 2001). WT programs differ in length and format. The field makes a distinction between *base-camping,* or camping in isolated environments, and *expedition-based camping,* which involves moving to different locations (Crisp, 1998). Further, WT programs may be distinguished as either *continuous flow programs* (i.e., leaders rotate in and out of the field) or as *contained programs* (i.e., the same leadership team remains within the group; Russell, 2001).

Commonalities of WT programs include their theoretical foundation, treatment process, and intended outcomes (Russell, 2001). First, WT programs are theoretically based and integrate therapeutic modalities (e.g., family systems or CBT) with outdoor programming (Russell, 2001). Second, WT programs contain common processes. Russell (2001) delineated three stages of WT programs: (a) the cleansing phase (i.e., removal

from dysfunctional environments and establishing healthy habits); (b) the personal and social responsibility phase (i.e., accepting responsibility and the natural consequences of nature); and (c) the final stage (i.e., transitioning out of WT and planning for aftercare). Last, WT programs are unified in their intended outcomes: establishing a sense of accomplishment and acquiring new skills (Russell, 2001).

Mechanisms of Change in Wilderness Therapy Programs

Several studies have focused on the process factors responsible for change through WT. Preliminary evidence from these studies suggests that potential change mechanisms of WT include (a) improved coping and interpersonal skills (Bettmann et al., 2013; Conlon et al., 2018), (b) positive bonding and group experiences with peers (Conlon et al., 2018; Norton, 2017), (c) positive communication with family members during treatment (Norton, 2017), (d) therapeutic experiences in nature (Norton, 2017), (e) enhanced motivation and sense of achievement (Conlon et al., 2018), (f) perceived choice and input in their individualized treatment plan (Conlon et al., 2018), (g) challenging group and individual adventure-based experiences (Norton et al., 2019; Russell & Phillips-Miller, 2002), (h) times of reflection and contemplation (Norton, 2017; Russell & Phillips-Miller, 2002), (i) perception of WT treatment as helpful (Russell et al., 2017), (j) perception of oneself and one's WT group as mindfully present and engaged (Gillis et al., 2016; Russell et al., 2017), and (k) therapeutically helpful and empathically supportive relationships with WT leaders (Russell & Phillips-Miller, 2002).

Research

Growing empirical evidence supports the effectiveness of WT. A meta-analysis of 36 studies (total N = 2,399; M_{age} = 17.4) revealed evidence that WT has a moderate-to-large effect in improving clients' behavioral functioning, intrapersonal functioning (e.g., self-esteem, locus of control), interpersonal functioning, and clinical functioning (e.g., depression symptoms; Hedges's g = 0.46 to 0.75; Bettmann et al., 2016). The effectiveness of WT has been supported regardless of whether (a) WT outcomes are measured by self-report or caregiver-report measures (Gillis et al., 2016; Russell, 2003; Tucker et al., 2016), (b) WT effectiveness is compared to that of traditional mental health treatment (DeMille et al., 2018) or an alternate residential treatment (Magle-Haberek et al., 2012), or (c) WT participants are voluntarily or involuntarily transported and admitted to the WT program (Tucker et al., 2016). Additionally, studies have shown that, relative to mildly or moderately distressed clients, adolescents with extreme distress see the greatest improvement from WT (Bowen et al., 2016; Combs et al., 2016; Magle-Haberek et al., 2012).

An early seminal study by Russell (2003) suggested that WT participants experience a clinically significant decrease in psychological distress. The study utilized the self-report and parent-report versions of the Youth Outcome Questionnaire (YOQ) to measure these changes. From intake to discharge, mean total scores decreased from 70.67 to 47.55 on the self-report and from 100.19 to 48.55 on parent-report (the clinical cutoff is 46). Treatment gains were maintained at 3-, 6-, and 12-month follow-ups (Russell, 2003). Bowen and Neill's (2013) meta-analysis of adventure-based therapeutic programs

examined 197 studies across eight outcomes: Academic, Behavior, Clinical, Family Development, Morality/Spirituality, Physical, Self-Concept, and Social Development. Results indicated that adventure-based wilderness therapy programs showed a moderate, significant change (.47) in short-term outcomes when compared to no treatment or alternative treatment groups. These short-term outcomes were sustained long-term (Bowen & Neill, 2013). With the exception of Morality/Spirituality (.17), all outcomes were found to be significant in the short term.

Wilderness Therapy in the Treatment of Trauma-Exposed Individuals

Despite growing evidence supporting WT's effectiveness, few studies have examined WT's usefulness for treating trauma. Those studies that exist examine WT and adult combat veterans. A 6-day WT program was found to successfully reduce psychological distress and enhance overall well-being for Australian military veterans (Bird, 2015). These effects were maintained at a 2-year follow-up. Elsewhere, Duvall and Kaplan (2014) found that 4-to-7-day WT programs were positively associated with increased psychological and social well-being in American military veterans. Similar to WT studies on youth, these benefits were most robust for veterans who reported the most severe mental or physical health problems.

To date, no studies have examined WT's effectiveness in treating trauma-exposed youth. However, Norton et al. (2019) conducted a pilot study examining the effectiveness of community-based, trauma-informed adventure therapy with maltreated youth (ages 8–17) and their families. The treatment group (n = 18) completed 3 months of weekly, 2-hour sessions of trauma-informed adventure therapy in addition to multimodal standard

trauma treatment (weekly individual and family therapy sessions). The comparison group (n = 14) only participated in standard trauma treatment. From intake to 3-months postintake, treatment-group youth reported greater reductions in depression, anxiety, anger, and PTSD symptoms, relative to comparison-group youth. Treatment-group caregivers also reported greater improvements in family communication and family functioning, relative to comparison-group caregivers (Norton et al., 2019).

The Current Study

The current study addressed several gaps. First, it addressed the lack of WT research that incorporates both self-report and caregiver-report outcome data (Tucker et al., 2016). Second, it addressed the call for WT research that includes postdischarge assessment; many existing studies only include pre–post assessment (Zelov et al., 2012). Third, it addressed the absence of research evaluating the effectiveness of TIWT or other complementary/integrative interventions (e.g., TCTSY, biofeedback, or BrainSpotting) for treating trauma in youth. Last, it addressed the need for WT studies to assess psychophysiological outcomes; to date, all WT studies have relied on questionnaire measures that assess psychological, family, social, or school outcomes.

The NVWT adolescent program is optimally designed to address these gaps in the WT literature. For instance, NVWT staff routinely collect self-report and caregiver-report outcome data at intake, discharge, and 6- and 12-months postdischarge. Staff also routinely collect psychophysiological data at intake and discharge, using HeartMath's emWave Pro software to measure how coherent clients' heart rhythm pattern is during two brief segments of HRV biofeedback. Lastly, NVWT is based upon previous complex

trauma research and adapted from typical WT to meet the needs of complex-trauma-exposed youth (Sawyer, n.d.). In addition to traditional WT activities, such as hiking, canoeing, and rock climbing, trauma-informed clinicians provide therapy to clients multiple times a week. Therapy includes phases traditional to complex trauma treatment, such as the establishment of safety, trauma processing, and reintegration with the world. Moreover, NVWT provides common complex trauma interventions such as TCTSY, BrainSpotting, and EMDR (Sawyer, n.d.).

In sum, NVWT is unique in its trauma-informed, attachment-based, psychophysiologically focused approach to WT. This quasi-experimental, mixed-method study sought to evaluate the effectiveness of NVWT's trauma-informed programming at pretreatment, posttreatment, and 1-year follow-up through retrospective review of routinely collected clinical quality improvement (or program outcome) data. This study utilized both self-report, parent-report, and psychophysiological measures. It tested the following hypotheses:

1. Participation in NVWT will be associated with improvement in clients' psychological functioning from intake to discharge, as measured by (1a) self-report and (1b) caregiver report.
2. Participation in the NVWT program will lead to improved psychophysiological functioning, as evidenced by heart-rhythm coherence during two segments of brief heart-rate-variability biofeedback: (2a) while resting and (2b) while coping.

3. Improvements in psychological functioning will be associated with improvements in psychophysiological outcomes over the course of participating in the NVWT treatment program.
4. Psychological and psychophysiological benefits will be maintained at 12-months postdischarge.
5. No differential outcomes will be associated with (5a) demographic factors (age, sex/gender, sexual orientation, race/ethnicity, caregiver-informant sex/gender, or caregiver marital status); (5b) intervention location (NVW Wisconsin or Oregon); or (5c) past treatment history (past outpatient, acute psychiatric, resident treatment, or WT).
6. Differential outcomes will be related to (6a) trauma exposure, (6b) intervention length, (6c) treatment motivation, and (6d) treatment effort.

The goal in testing these hypotheses was to provide preliminary support for NVWT as an option for treating complex trauma in adolescents.

Methods

Participants

In order to be included in this study, participants had to (a) be between ages 13 and 17 during treatment at NVWT, (b) have been admitted and discharged from NVWT between October 2009 and September 2019, and (c) have complete intake and discharge data. Eight hundred and sixteen (57.7%) participants of 1,415 met these inclusion criteria.

Of the 816 participants, 481 (58.9%) were male and 335 (41.1%) were female. The mean age of participants was 15.26 years old (*SD* = 1.25). The majority of participants were Caucasian (69.2%), followed by Hispanic/Latinx (8.6%), Other (8.6%), and Asian American (7.6%). Smaller percentages identified as African American (5.0%) and Native American (1.0%). Regarding sexual orientation, 305 participants identified as straight (78.4%), 40 as bisexual (10.3%), 29 as Other/Unsure (7.5%), and 15 as gay or lesbian (3.9%).

The majority (35.3%) of participants were referred primarily for a trauma-related issue (i.e., PTSD, reactive attachment disorder, etc.). The most common (31.6%) secondary reason for referral was an anxiety issue. Given this study's emphasis on complex trauma, demographics regarding exposure to abuse were collected from the participants' therapists. However, 195 therapists responded "unsure" regarding participants' experienced physical abuse, and 204 responded "unsure" regarding participants' exposure to sexual abuse. Of the remaining data, 18.3% of participants were known to have exposure to physical abuse, and 15.2% were known to have exposure to sexual abuse. Additional demographic information is presented in Table 1.

Intervention

NVWT is a continuous trekking WT program. The average length of stay is approximately 80 days. During this time, youth participate in a backcountry wilderness expedition paired with a multimodal therapeutic intervention model.

Table 1

Demographic Characteristics of NVWT Teen Sample

Characteristic	*n* (Valid %)
Sex or gender identity	
Male	481 (58.9)
Female	335 (41.1)
Race/Ethnicity	
African American	15 (5.0)
Asian American	23 (7.6)
Hispanic/Latinx	26 (8.6)
Native American	3 (1.0)
White	209 (69.2)
Other	26 (8.6)
Sexual orientation	
Heterosexual (straight)	305 (78.4)
Homosexual (gay or lesbian)	15 (3.9)
Bisexual	40 (10.3)
Other/Unsure	29 (7.5)
Caregiver marital status	
Married	174 (66.9)
Divorced	47 (18.1)
Separated	15 (5.8)
Single, never married	12 (4.6)
Widowed	12 (4.6)
Experienced/Witnessed physical abuse	
Yes	59 (18.3)
No	69 (21.4)
Unsure	195 (60.4)
Experienced/Witnessed sexual abuse	
Yes	49 (15.2)
No	70 (21.7)
Unsure	204 (63.2)
Alcohol/Substance abuse	61 (16.7)
Anxiety issue	57 (15.6)
Depression/Mood disorder	103 (28.2)
Oppositional defiance/Conduct disorders	11 (3.0)
Trauma-related issue (PTSD, RAD, etc.)	129 (35.3)
Other	4 (1.1)
Secondary reason for referral	
Alcohol/Substance abuse	48 (14.0)
Anxiety issue	108 (31.6)
Depression/Mood disorder	104 (30.4)
Oppositional defiance/Conduct disorders	23 (6.7)
Trauma-related issue (PTSD, RAD, etc.)	32 (9.4)
Other	27 (7.9)
Previous outpatient therapy	
Yes	259 (85.5)
No	44 (14.5)
Previous acute psychiatric care (e.g., hospital)	
Yes	122 (40.3)
No	181 (59.7)
Previous residential treatment program	
Yes	56 (18.5)
No	246 (81.5)
Previous therapeutic wilderness program	
Yes	105 (35.0)
No	195 (65.0)
Psychiatric medication in past 6 months	
Yes	265 (67.9)
No	125 (32.1)

Note. NVWT = New Vision Wilderness Therapy; PTSD = posttraumatic stress disorder; RAD = reactive attachment disorder. Totals of percentages are not 100 for every characteristic because of rounding.

Each participant receives psychotherapy a minimum of two times per week and works with a master's level clinician (e.g., licensed professional counselor, licensed marriage and family therapist, or licensed clinical social worker). Although traditional WT emphasizes survival skills and outdoor activity, NVWT is a TIWT program that prioritizes relationships with staff and with group members. Specifically, NVWT's trauma-informed programming seeks to build psychophysiological coherence, emotion regulation, and relational safety in its teens. Several psychophysiological interventions are employed to this end. For instance, TCTSY is utilized in individual sessions and in group format. Many participants receive BrainSpotting or EMDR in order to aid the reprocessing of trauma memories. HeartMath techniques are woven throughout the program in order to aid participants in establishing physiological safety prior to embarking on activities.

Measures

Demographic and Trauma-Relevant Information

The National Association of Therapeutic Schools and Programs (NATSAP) Adolescent Questionnaire, Parent Questionnaire, and Staff Questionnaire were utilized to collect demographic and treatment-relevant information.

Psychological Functioning

The Y-OQ-SR 2.0 and Y-OQ 2.01 are self-report and caregiver-report questionnaires that measure changes in psychological distress for adolescents ages 12 to 18. Both measures are comprised of 64 items and yield a total score that ranges from -16 to 240. Items are rated on a 5-point Likert scale, ranging from 0 (*never*) to 4 (*almost always*). Both measures are comprised of six subscales: Intrapersonal Distress (e.g., "I worry and can't get thoughts out of my mind," "seems nervous or anxious"); Somatic Complaints (e.g., "I have headaches or feel dizzy," "soils or wets self"); Interpersonal Relations (e.g., "I have a hard time trusting friends, family members, and other adults," "enjoys relationships with family and friends"); Social Problems (e.g., "I have physical fights …," "is aggressive toward adults"); Behavioral Dysfunction (e.g., "I cut classes or skip school altogether," "deliberately breaks rules, laws, or expectations"); and Critical Items ("I have hurt myself on purpose …," "thinks about suicide, says s/he would be better off if s/he were dead" (Burlingame et al., 2005). Both measures yield a Total Distress score. The YOQ-SR-2.0 and Y-OQ 2.01 both also yield two statistical indices to identify clinically significant change: the Reliable Change Index (RCI) (i.e., the smallest difference in total scores that is distinguishable from measurement error) and clinical cutoff scores (which differentiate clinical and non-clinical levels of distress). For both measures, the RCI is 13 points and the clinical cutoff score is 46.

Research indicates that both the Y-OQ-SR 2.0 and Y-OQ 2.01 are psychometrically sound measures, with high internal consistency, test-retest reliability, convergent validity, discriminant validity, and sensitivity to change (Burlingame et al.,

2004; McClendon et al., 2011; Ridge et al., 2009). Internal consistency for the six Y-OQ-SR 2.0 subscales ranges from .71 to .91. Across a wide variety of samples, both the YOQ-SR 2.0 and Y-OQ 2.01 total scores have shown good internal consistency as well (e.g., total scores alphas ≥ .95).

Psychophysiological Functioning

To collect psychophysiological data, the HeartMath emWave Pro was utilized. This system monitors HRV using a fingertip or earlobe plethysmographic sensor. At both admission and discharge, participants' HRV and coherence data were collected for 2.5 minutes while the participant was at rest. The data were then collected for a second 2.5-minute time period during which participants were asked to use a coping skill of choice. Changes in heart rhythms can be seen in real time on the computer screen. The system also calculates coherence ratios. These ratios range from 0 to 16, with higher scores indicating higher stability of heartbeat and overall psychophysiological health. Scores of 1.00 to 1.99 are thought to indicate good coherence, 2.00 to 2.99 to indicate very good coherence, and above 3.00 to indicate excellent coherence (HeartMath, 2018).

Procedures

This study utilized archival data routinely collected by NVWT for outcome monitoring. Caregivers and participants gave their written consent or assent for their data to be used for research and program evaluation purposes. Notably, NVWT's outcome monitoring practices evolved over the 10-year time period in which data were collected for this study. From October 2009 to October 2013, NVWT only collected Y-OQ-SR 2.0

data. Collection for psychophysiological data (i.e., emWave Pro usage) began in October 2013. In January 2014, NVWT began collecting demographic information from participants, caregivers, and clinicians utilizing the NATSAP measures. In May 2015, NVWT implemented the Y-OQ 2.01 and also began monitoring self-reported outcomes at follow-up periods of 6 months and 1 year postdischarge. Throughout this evolution, measures were completed either by paper or online.

Results

To test Hypotheses 1, 2, and 4, a series of paired-samples *t* tests were employed, respectively comparing each measure's discharge and 1-year postdischarge scores to corresponding intake (baseline) scores on that measure. Results for Hypothesis 1 can be viewed in Tables 2 and 3. To test Hypothesis 3, a series of correlational analyses were conducted to examine the relationships among change scores on each omnibus outcome measure (Y-OQ total scores and coherence scores), relative to intake scores (see Table 4). To test Hypotheses 5 and 6, a series of multiple regression analyses were conducted, examining the degree to which demographic factors, past treatment history, past trauma exposure, and current treatment factors predicted change scores (see Table 5). For all analyses, unless otherwise noted, due to the large number of tests conducted for each hypothesis, a Bonferroni correction was used that required $p < .001$ to indicate significance.

Hypothesis 1: Improvements in Psychological Functioning

Results of the paired-samples *t* test demonstrate full support of the hypothesis that participants will experience an increase in psychological functioning. From intake to

discharge, teens reported significant decrease in overall distress as measured by the Y-OQ-SR 2.0. Significant reductions in emotional distress, somatic distress, relational problems, problematic social behaviors, behavioral dysfunction, and clinically critical problems were found (see Table 2). Likewise, results on the caregiver report suggest significant reduction in these areas (see Table 2). Those caregiver-observed intervention benefits were large in size (d = 1.55 for total score and d = 0.92 to d = 1.41 for subscores), and most were below the clinical cutoff score (i.e., < 46).

Table 3 presents Y-OQ distress and change levels as a function of time. At intake, only 25.4% of teens reported experiencing low psychological distress, whereas 74.7% reported moderate or moderately high distress. In contrast, at discharge, 55.1% of teens reported low distress, 25.4% reported moderate distress, and only 19.5% reported moderately high distress. Teens' self-reported changes from intake were categorized into the five aforementioned categories (see Measures section; Cannon et al., 2010): 41.1% had recovered, 21.0% had reliably improved, 26.8% demonstrated no reliable change, 9.1% had deteriorated, and 2.1% had gotten reliably worse. These trends were more pronounced from caregivers' perspective. At intake, only 2.6% of teens were rated by their caregivers as exhibiting low distress, with 20.6% of teens rated as exhibiting moderate distress and 76.8% as exhibiting moderately high to high distress. By comparison, at discharge 87.8% of teens were rated as showing either low or moderate distress. Teens' caregiver-reported changes were categorized into the same five categories.

Table 2

Summary of Youth Outcome Questionnaire (Y-OQ) Data as a Function of Time

Y-OQ score	Possible range	T1 (intake) *M (SD)*	T2 (discharge) *M (SD)*	T3 (6-month) *M (SD)*	T4 (1-year) *M (SD)*	$t_{1,2}$	$t_{1,3}$	$t_{1,4}$
Self-report (Y-OQ-SR)		*n* = 816		*n* = 81	*n* = 32			
Total (overall) distress	-16–240	69.57 (32.72)	44.50[a] (27.17)	49.54 (34.33)	47.53 (31.67)	21.48*	4.50*	2.04
Intrapersonal distress	-4–68	24.41 (12.88)	15.61[a] (9.33)	19.57 (12.38)	18.13 (11.93)	19.86*	3.24	1.67
Somatic	0–32	7.90 (5.24)	5.92 (4.03)	5.86 (5.24)	5.44 (4.73)	12.46*	3.21	0.87
Interpersonal relations	-6–34	6.00 (5.59)	2.38[a] (4.95)	3.23[a] (5.31)	3.13[a] (5.05)	16.78*	3.25	1.47
Social problems	-2–30	7.67 (5.63)	3.30 (4.65)	2.74[a] (4.61)	2.91[a] (4.09)	21.87*	7.08*	3.78*
Behavioral dysfunction	-4–40	15.01 (6.95)	11.24[a] (6.36)	11.73[a] (7.22)	11.38[a] (7.21)	15.12*	4.06*	1.57
Critical items	0–36	8.57 (5.56)	6.06 (4.17)	6.41 (5.72)	6.56 (5.78)	13.76*	3.36*	1.34
Caregiver-report (Y-OQ)		*n* = 189		*n* = 99	*n* = 59			
Total (overall) distress	-16–240	99.30 (27.20)	41.58[a] (33.06)	54.11 (37.14)	53.25 (38.87)	21.33*	10.82*	7.80*
Intrapersonal distress	-4–68	34.25 (10.59)	17.04 (11.71)	21.65 (13.43)	20.49 (13.60)	17.70*	8.63*	6.62*

Somatic	0–32	7.59 (4.30)	3.53[a] (3.58)	4.63[a] (4.25)	4.80[a] (4.13)	12.57*	5.83*	4.67*
Interpersonal relations	-6–34	14.57 (6.18)	3.94[a] (6.57)	5.60 (7.08)	5.73 (7.54)	18.73*	10.57*	7.13*
Social problems	-2–30	11.74 (5.59)	2.58[a] (4.74)	3.86 (4.73)	4.90 (5.76)	19.13*	11.42*	6.26*
Behavioral dysfunction	-4–40	22.30 (6.89)	10.45[a] (7.94)	13.39 (8.75)	12.78 (9.51)	19.43*	9.88*	6.93*
Critical items	0–36	8.65 (4.67)	4.04[a] (3.62)	4.99[a] (4.17)	4.56[a] (4.02)	14.02*	8.71*	6.72*

Note. For all scores, higher means indicate higher levels of the measured construct. The first follow-up occurred at 6-months postdischarge, and the second follow-up occurred at 12-months postdischarge.

[a] Below the clinical cutoff score for that particular Y-OQ scale or subscale. According to Burlingame et al. (2004), those clinical cutoff scores are as follows: (a) Total score of 46 or above, (b) Intrapersonal Distress subscore of 16 or above, (c) Somatic subscore of 5 or above, (d) Interpersonal Relations subscore of 4 or above, (e) Social Problems subscore of 3 or above, (f) Behavioral Dysfunction subscore of 12 or above, and (g) Critical Items subscore of 5 or above.

*$p < .001$.

According to caregivers, 60.3% of teens had recovered, 28.6% had reliably improved, 9.5% demonstrated no reliable change, and only 1.6% had either deteriorated

or become reliably worse.

Table 3

Summary of Youth Outcome Questionnaire (Y-OQ) Distress and Change Levels as a Function of Time

YOQ score	T1 (intake)		T2 (discharge)		T3 (6-month follow-up)		T4 (1-year follow-up)	
	N	%	*n*	%	*N*	%	*n*	%
Self-report (YOQSR2.01)	*n* = 816				*n* = 81		*n* = 32	
Current distress								
Low	207	25.4	450	55.1	42	51.9	17	53.1
Moderate	198	24.3	207	25.4	18	22.2	8	25.0
Moderately high	411	50.4	159	19.5	21	25.9	7	21.9
Change from intake								
Recovered			335	41.1	36	44.4	14	43.8
Reliably improved			171	21.0	12	14.8	3	9.4
No reliable change			219	26.8	13	16.0	4	12.5
Deteriorated			74	9.1	18	22.2	10	31.3
Reliably worse			17	2.1	2	2.5	1	3.1
Parent-report (YOQ2.01)	*n* = 189				*n* = 99		*n* = 59	
Current distress								
Low	5	2.6	117	61.9	39	39.4	26	44.1
Moderate	39	20.6	49	25.9	39	39.4	20	33.9
Moderately high	43	22.8	10	5.3	10	10.1	6	10.2
High	102	54.0	13	6.9	11	11.1	7	11.9
Change from intake								
Recovered			114	60.3	39	39.4	26	44.1
Reliably improved			54	28.6	43	43.4	21	35.6
No reliable change			18	9.5	8	8.1	7	11.9
Deteriorated			2	1.1	9	9.1	5	8.5
Reliably worse			1	0.5	0	0.0	0	0.0

Note. Clients were categorized into five categories, based on the classification system Cannon et al. (2010) used to classify change from intake:

(a) *recovered* (Reliable Change Index [RCI] ≥ 13 points and their most recent total score was < 46), (b) *reliably improved* (RCI ≥ 13 points but most recent total score was ≥ 46), (c) *no reliable change* (RCI < 13 points), (d) *deteriorated* (RCI ≥ 13 points and most recent total score ≥ 46), or (e) *reliably worse* (RCI ≥ 13 points but most recent total score < 46).

Hypothesis 2: Improvements in Psychophysiological Functioning

Results of the paired-samples *t* test indicate that teens experienced significant improvement in their psychophysiological functioning. Resting coherence scores were maintained in the *good* range (i.e., between 1.00 and 1.99). Coherence scores while using a coping skill improved from the *good* to the *very good* range. Such results suggest that NVWT participants experienced modest improvement in resting psychophysiological coherence and significant improvement in their psychophysiological coherence while using a coping skill.

Hypothesis 3: Relation Between Changes in Psychophysiological Coherence and Changes in Psychological Outcomes

Hypothesis 3 was largely unsupported (see Table 4). Only one of the eight correlations were significant at the $p < .001$ level. Change in resting psychophysiological functioning was weakly related to change in psychophysiological coherence while coping ($r = .23$). However, it generally appears that pre/post changes in psychological functioning are unrelated to changes in psychophysiological functioning.

Hypothesis 4: Maintenance of Psychological Benefits

Hypothesis 4 was partially supported. Caregiver-observed psychological benefits were maintained at both 6-month and 12-month follow-up. The effects were moderate-to-large in size. For participant-reported psychological benefits, only four of seven benefits were maintained at 6-month follow-up: (a) reduced overall distress (d = 0.43, small-to-moderate effect); (b) problematic social behaviors (d = 0.80, strong effect); (c) behavioral dysfunction (d = 0.39, small-to-moderate effect); and (d) clinically critical problems (d = 0.29, small effect). At 1-year postdicharge only one of the psychological benefits were reported by teens to be maintained: reduced problematic social behaviors (d = 0.67, moderate effect).

Table 4

Intercorrelations Among Changes in Psychological and Psychophysiological Functioning

Change score	1	2	3	4	5	6	7	8
1. YOQ-SR[a]	--							
2. YOQ-P[a]	.10	--						
3. Coherence while resting[a]	-.05	.03	--					
4. Coherence while coping[a]	.03	-.06	.23*	--				
5. YOQ-SR[b]					--			
6. YOQ-P[b]					.42	--		
7. YOQ-SR[c]							--	
8. YOQ-P[c]							.67	--

Note. YOQ-SR = Youth-Outcome Questionnaire–Self-Report 2.01; YOQ-P = Youth–Outcome Questionnaire 2.0.

[a] Change score from intake to discharge. [b] Change score from intake to 6-month postdischarge follow-up. [c] Change score from intake to 1-year postdischarge follow-up.

*$p < .001$.

Hypothesis 5: Differences Based on Demographics, Location, or Treatment History

A series of multiple regression analyses (excluding cases pairwise) were conducted to analyze Hypothesis 5. A Bonferroni correction of .003 to correct for 15 predictors was used. This hypothesis was fully supported by the results (see Table 5). No significant differences were found on the basis of demographic factors (age, sex/gender, race/ethnicity, caregiver-informant sex/gender, or caregiver marital statues); past treatment history (outpatient, acute psychiatric, residential treatment, or WT); or NVW treatment location (Wisconsin or Oregon).

Hypothesis 6: Differences Based on Trauma Exposure and on Treatment Factors

To test Hypothesis 6, a series of multiple regression analyses (excluding cases pairwise) were conducted. This hypothesis was generally unsupported. To test Hypothesis 6a (differential effectiveness on the basis of trauma exposure), teens were categorized as trauma-exposed if they (a) had a primary or secondary trauma-related diagnosis (e.g., PTSD, reactive attachment disorder) and/or (b) were exposed to physical abuse or sexual abuse. Table 5 shows the results, which indicate trauma exposure did not predict differential effectiveness for psychological or psychophysiological outcomes.

Table 5

Regression Analysis Summary for Demographic Factors, Past Treatment History, Past Trauma Exposure, and Current Treatment Factors Predicting Change in Psychological, Family, and Psychophysiological Outcomes

	ΔY-OQ-SR		ΔY-OQ-P		Δ coherence while resting		Δ coherence while coping	
Predictor variable	β	*r*	β	*r*	β	*r*	β	*r*
Demographic factors								
Age	-.14	-.14	-.04	-.04	-.03	-.03	-.04	-.04
Sex/Gender (1 = female)	-.12	-.11	.03	.03	-.07	-.06	-.24	-.22
Sexual orientation (1 = sexual minority)	-.12	-.11	.05	.04	-.04	-.03	-.07	-.06
Race/Ethnicity (1 = racial/ethnic minority)	.13	.13	.06	.06	-.10	-.09	-.14	-.14
Caregiver-informant sex/gender (1 = female)	.07	.07	-.06	-.06	-.01	-.01	-.11	-.10
Caregiver marital status (1 = now married)	-.02	-.02	-.01	-.01	-.09	-.08	.00	.00
Past treatment history								
Ever participated in outpatient therapy (1 = yes)	.06	.06	.05	.05	-.15	-.14	.06	.06
Ever been in acute psychiatric care/hospital (1 = yes)	-.14	-.13	.07	.06	-.01	-.01	.03	.02
Ever been placed in residential treatment (1 = yes)	.01	.01	-.09	-.09	.02	.02	.10	.10
Ever been placed in wilderness therapy (1 = yes)	.00	.00	.01	.01	.08	.07	.02	.02
Past trauma exposure (1 = yes)	.01	.01	.13	.12	-.03	-.03	-.05	-.05
Current treatment factors								
Treatment location (0 = Wisconsin, 1 = Oregon)	-.04	-.04	-.06	-.06	.13	.12	.08	.08
Treatment length	-.02	-.02	-.25	-.24	.03	.03	.10	.09
Initial self-reported treatment motivation	.10	.10	.19	.18	.05	.04	-.10	-.10
Self-reported treatment effort	-.21**	-21**	-.13	-.13	-.08	-.07	-.09	-.09
R^2 (adjusted R^2)	.18 (.12)		.18 (.08)		.08 (-.03)		.16 (.06)	
p	.000		.039		.759		.066	
ns	251–816		189–816		251–816		251–816	

Note. Δ = change; Y-OQ-SR=Youth-Outcome Questionnaire-Self-Report; Y-OQ-P = Youth-Outcome Questionnaire 2.01 (parent-report); β = standardized beta coefficient; sr = semipartial (part) correlation coefficient. Change scores reflect the discharge score minus the intake score. Trauma exposure was operationalized as (a) having an initial primary or secondary diagnosis of at least one trauma-/stressor-related disorder (e.g. PTSD, reactive attachment disorder, adjustment disorder, or unspecified trauma-/stressor-related disorder); (b) having experienced confirmed physical abuse; and/or (c) having experienced confirmed sexual abuse.

***p* < .003 (Bonferroni correction for 15 predictors: .05/15 = .003).

To test Hypotheses 6b, 6c, and 6d, a series of multiple regression analyses were conducted (see Table 5). No differential effects were found based on treatment length or initial self-reported treatment motivation (negative vs. positive feelings about participating in NVWT). There was only one differential effect on the basis of adolescents' treatment effort. Adolescents who reported putting more effort into the treatment also evidenced greater self-reported benefits in psychological functioning, relative to adolescents who reported putting forth less effort, β = -.21, $r(330) = -.21$, $p = .002$ (a small effect).

Discussion

Results of the current study show that participants reported moderate-to-large improvements in psychological functioning, and they also showed small-to-moderate improvement in psychophysiological functioning. Likewise, caregivers reported observing large improvements in their teen's psychological functioning. Compared with

teen self-report, caregivers reported noticing more enduring psychological benefits at 6-month and 12-month follow-up. For both participants and caregivers, psychophysiological functioning was largely unrelated to changes in psychological functioning. Very few differential factors were found on the basis of demographic factors, trauma exposure, and past or current treatment factors. The following differential factors were observed: (a) comparatively greater improvement in psychological functioning for older teens, female participants, and sexual-minority participants; (b) greater psychophysiological improvement for male participants; (c) and greater psychological improvements for teens who reported putting more effort into their treatment.

Results of this study are consistent with prior findings in WT literature. For instance, this study is consistent with Gillis et al.'s (2016) finding that caregivers report greater improvements in teens' psychological functioning compared to the teens themselves. Consistent with Bettmann et al. (2016) and Russell (2003), NVWT was shown to improve client psychological functioning. This result is also in line with Norton et al.'s (2019) finding that trauma-informed adventure therapy can reduce psychological distress. Likewise, results of this study are in line with Bowen & Neill's (2013) and Russell's (2003) findings that gains made in WT are maintained at long-term follow-up. Thus, this study further supports the findings that WT, and TIWT in particular, appears to improve psychological functioning, and that these benefits can be maintained postdischarge, when individual and family psychotherapy is implemented during the follow-up (Tucker et al., 2016; Zelov et al., 2012).

Contrary to previous studies on adult veterans, this study found no differential outcomes on the basis of trauma-related issues or exposure (Duvall & Kaplan, 2014). Although this finding could suggest that NVWT is effective for both trauma-exposed and non-trauma-exposed teens, it is also possible that this finding is related to this study's lack of a trauma-specific measure. Specifically, this study did not utilize a comprehensive measure of trauma exposure (including maltreatment, emotional abuse, community violence, etc.), and it did not use a validated measure of posttraumatic stress either. Thus, the trauma-related information gathered by the NATSAP might underreport the rate of trauma-exposure in the sample. This is a major limitation of this study, and future research should be sure to implement a comprehensive measure of trauma exposure and posttraumatic stress symptoms.

This study had several other notable limitations. Specifically, the study contained no measure of process factors that led to change. Therefore, results could only determine whether or not NVWT as a whole was beneficial—not the specific treatment components that were most effective. Additionally, the study had neither a control group nor an alternative-treatment comparison group. Thus, comparison could not be made between NVWT participants and teens receiving either no treatment or another form of treatment. Another noteworthy limitation is the evolution of outcome monitoring procedures at NVWT, which impacted data analysis for this study. From 2009 to 2013 only Y-OQ-SR data were available. As a result, this study contained a great deal more data for self-reported psychological functioning compared to other outcome data (i.e., caregiver-report data and psychophysiological data). Last, response rates for several postdischarge

outcome measures were low—a common issue across WT research (e.g., Bowen & Neill, 2013).

Based on the limitations of this study, several recommendations can be made for NVWT's outcome monitoring procedures and for future TIWT research more broadly. First, the inclusion of a trauma-specific measure is necessary to examine trauma exposure among NVWT participants. For instance, the Children's PTSD Symptom Scale (CPSS) and the Trauma Symptoms Checklist for Children (TSCC) are two widely used and well-validated measures for assessing trauma symptoms in youth (Foa et al., 2001; Lanktree et al., 2008; Nixon et al., 2013). Likewise, the inclusion of a trauma-exposure measure is necessary in order to assess the frequency and the types of trauma exposure NVWT participants have encountered. Two commonly used and well-validated measures for trauma exposure in children and adolescents are the UCLA PTSD Reaction Index for DSM-5 (PTSD-RI-5) and the Traumatic Events Screening Instrument (TESI; Daviss, Mooney, et al., 2000; Daviss, Racusin, et al., 2000; Doric et al., 2019; Steinberg et al., 2013). Assessing both the trauma symptoms and the trauma exposure in NVWT's participants is necessary in assuring that NVWT is effectively treating complex trauma. Second, the Adventure Therapy Experiences Scale (ATES; Russell & Gillis, 2017) is a psychometrically sound measure for assessing the process factors that lead to change in WT. Inclusion of the ATES at intake, discharge, and postdischarge would help NVWT understand the treatment factors that are most effective in reducing client symptomatology. To this end, it is also recommended that NVWT create and adhere to a uniform treatment protocol, as currently participants receive different treatment

components (e.g., TCTSY, BrainSpotting, EMDR). A uniform approach to treatment will better enable NVWT to assess which program components are most effective in treating complex trauma. Lastly, it is recommended that NVWT stay consistent in their outcome measuring procedures and that these procedures are practiced with fidelity by NVWT clinicians. Fidelity in outcome monitoring will be especially necessary for future research conducted at NVWT in order to gain a more accurate and well-rounded picture of treatment at NVWT.

This study holds great implication for trauma treatment. Results of this quasi-experimental study provide preliminary support for NVWT's effectiveness in improving psychological and psychophysiological functioning in trauma-exposed adolescents. NVWT's programming is consistent with the larger body of evidence-based adolescent trauma-informed treatment that includes an emphasis on attachment, emotion regulation, and competency-building (Cloitre et al., 2011, 2012). This evaluation supports the use of these traditional complex-trauma treatment domains. Moreover, NVWT emphasizes physiological impacts of trauma, and this study highlights the effectiveness of a

physiological emphasis in treatment. Ongoing evaluation of physiologically based treatment is crucial as the complex trauma field increasingly aims to bring to body into treatment (Emerson, 2015). This study contributes to this aim by suggesting that clinicians may find an emphasis on enhancing psychophysiological coherence to be effective in treatment. Despite limitations, the evidence of this study provides compelling findings suggesting that NVWT, and TIWT more generally, is an effective treatment for

youth exposed to complex trauma. Further rigorous efficacy and effectiveness research is warranted to expand on this study's promising results.

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