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The Effects of Systemic Adventure and Nature Therapy on Military Personnel With PTSD.

Die Auswirkungen systemischer Abenteuer- und Naturtherapie auf Militärpersonal mit PTSD.

Abstract

Posttraumatic stress disorder (PTSD) in military personnel is a complex disease with far reaching individual, societal and economic consequences. Although first line treatments, such as eye movement desensitization and reprocessing therapy (EMDR), imagery rescripting and reprocessing therapy (IRRT), prolonged exposure (PE), and cognitive-behavioral therapy (CBT) consider the suggestions of recent PTSD theories (emotional processing theory, dual representation theory, cognitive model) some patients remain with significant residual symptomatology. The reason may be treatment barriers and challenges that are associated with military personnel PTSD. Therefore, additional treatment approaches are required to improve military personnel PTSD recovery. Systemic adventure and nature therapy (SANT) was investigated in this study as such a complementary treatment approach. Participants (N = 2) were military personnel with PTSD who received an online SANT intervention. Their PTSD symptoms before and after the intervention were compared. Moreover, this experimental group was compared to the treatment as usual (TAU) control group of Beetz, Schöfmann, Girgensohn, Braas and Ernst (2019), consisting of military personnel with PTSD (N =31). It was hypothesized that participants in the experimental group would have less PTSD symptoms after treatment compared to participants in the control condition (H1) and a PTSD symptom pre-test (H2). Results showed that participants' PTSD symptoms did not improve after the additional SANT intervention. However, the SANT experimental group had decreased PTSD symptoms compared to the TAU control group, indicating that SANT may be an effective addition to TAU. Results have to be interpreted under consideration of four limitations that occurred due to the COVID-19 pandemic.

Keywords

Abstract (deutsch)

Die posttraumatische Belastungsstörung (PTBS) bei Militärpersonal ist eine komplexe Erkrankung mit weitreichenden individuellen, gesellschaftlichen und wirtschaftlichen Folgen. Obwohl Erstlinientherapien wie die Eye Movement Desensitization and Reprocessing Therapy (EMDR), die Imagery Rescripting and Reprocessing Therapy (IRRT), die Prolonged Exposure (PE), und die kognitive Verhaltenstherapie (CBT) auf den Grundlagen aktueller PTBS-Theorien (Emotional Processing Theory, Dual Representation Theory, Cognitive Model) basieren, bleibt bei einigen Patienten eine signifikante Restsymptomatik bestehen. Der Grund dafür könnte mit den verschiedenen Barrieren und Herausforderungen, welche bei der Behandlung von PTBS bei Militärpersonal auftreten können, zusammenhängen. Um eine vollständige Genesung von PTBS bei Militärpersonal zu erreichen, sind daher zusätzliche Behandlungsansätze erforderlich. Die systemische Abenteuer- und Naturtherapie (SANT) wurde in dieser Studie als ein solcher ergänzender Behandlungsansatz untersucht. Die Teilnehmer (N = 2) waren Militärangehörige mit PTBS, die eine Online-SANT-

Intervention erhielten. Ihre PTBS-Symptome vor und nach der Intervention wurden vergli- chen. Außerdem wurde diese Versuchsgruppe mit der Kontrollgruppe von Beetz, Schöf- mann, Girgensohn, Braas und Ernst (2019), bestehend aus Militärpersonal mit PTBS (N = 31), verglichen. Die Hypothese war, dass die Teilnehmer in der Versuchsgruppe nach der Behandlung weniger PTBS-Symptome aufweisen würden, im Vergleich zu den Teilnehmen- den der Kontrollgruppe (H1) und einem PTBS-Symptom-Pretest (H2). Die Ergebnisse zeig- ten, dass sich die PTBS-Symptome der Teilnehmer nach der zusätzlichen SANT-Intervention nicht verbesserten. Die SANT-Versuchsgruppe wies jedoch im Vergleich zu der Kontroll- gruppe geringere PTBS-Symptome auf. Dies deutet darauf hin, dass SANT eine wirksame Ergänzung zu der Erstlinienbehandlung von Militärpersonal mit PTBS sein könnte. Durch die COVID-19 Pandemie konnte die Studie nicht wie geplant durchgeführt werden. Daher sollten die Ergebnisse unter der Berücksichtigung verschiedener Einschränkungen inter- pretiert werden.

Keywords (deutsch)

Systemische Natur- und Erlebnistherapie; Posttraumatische Belastungsstörung; Militärper- sonal; Zweitlinienbehandlung

1. PTSD and Military Personal

According to the DSM-V, post-traumatic stress disorder (PTSD) can develop after the experience of a traumatic event that confronts the individual with a life-threatening situation, serious injury, or sexual violence (American Psychiatric Association 2013). The event can be either experienced or witnessed personally or experienced through traumatic stories from close others or at work. Symptoms of PTSD include the intrusion or re-experience of the trauma. Patients suffer from unwanted trauma-related memories, nightmares, and flashbacks, in which they relive parts of the traumatic event. These memories are connected to negative emotions and stress, which is why patients also show avoidance symptoms. They avoid situations that remind them of the trauma. This consequently often leads to social isolation. Moreover, PTSD symptoms include changes in reactivity and arousal. Patients are in a constant mode of physical and psychological arousal and suffer from irritable feelings, decreased concentration, aggressive behavior, self-destructive behavior, and sleeping problems. Besides these main criteria, patients can suffer from negative changes in thoughts and feelings. These can be very similar to depression, including feelings of self-blame, loss of motivation, feelings of anxiety, sadness, and emotional numbing (American Psychiatric Association 2013).

Due to their involvement in crisis and war zones, military personnel have an increased risk for experiencing stressful and traumatic events and consequently a high prevalence of developing PTSD (Wittchen, Schönfeld, Kirschbaum, Trautmann, Thurau, Siegert et al. 2013). The German military reported that 2.9% of the soldiers that returned from foreign operations in Afghanistan, meet the criteria for PTSD (Wittchen et al. 2013). Estimated numbers of soldiers who do not have received a diagnosis and treatment for PTSD yet are assumed to be twice as high. Therefore, increased demand for PTSD services in military hospitals is to be expected in the coming years (Wittchen et al. 2013). Besides that, PTSD in military personnel is often accompanied by comorbid disorders, such as anxiety disorder or substance use disorder, extensive functional impairments such as unemployment, relationship difficulties, and poor quality of life (Gelkopf, Hasson-Ohayon, Bikman, Kravetz 2013). Therefore, PTSD in military personnel is a complex disorder with far-reaching societal and economic consequences and a great demand for effective treatment.

2. PTSD Theories

The three most recent and supported theories that aim to explain the development and maintenance of PTSD are the emotional processing theory, dual representation theory, and the cognitive model (Brewin and Holmes 2003).

The emotional processing theory, developed by Foa and Kozak (1986) and later updated by Rauch and Foa (2006), proposes that fear is represented in the memory as a structure that consists of fear stimuli, responses, and meaning. When activated, the goal of the fear structure is to react appropriately to a threatful situation. For example, the sound of a gunshot can be included in a fear structure and by that serve as a fear stimulus. Therefore, hearing a gunshot can activate the fear structure and trigger cognitive, behavioral, and physical responses, such as racing thoughts, seeking the source of threat, and an increased heart rate. Besides that, the fear stimuli activate an associated meaning, for instance, that one's own life is at risk. For healthy individuals, these fear structures create appropriate and helpful reactions to threatful situations. However, they can also become dysfunctional. Pathological fear structures associated with PTSD include excessive stimulus and responses. For example, a soldier that survived an auto bomb attack may inappropriately associate green cars with danger, because the car that exploded was green. In reality, however, green cars are no more dangerous than other colored cars. Therefore, excessive attention for a certain stimulus (green car) and excessive response to it (fear, heart racing, etc.) are incorporated into the fear structure. Additionally, problematic meaning-making, such as regret or feelings of incompetence that are related to the trauma can be incorporated into the fear structure. Therefore, according to the emotional processing theory, the two basic underlying conditions for PTSD are perceiving the world as a dangerous place and perceiving one's own identity as incompetent dealing with that. For effectively treating the disorder, the dysfunctional fear structure needs to be changed. This requires a fear structure activation and the replacement of unrealistic fear structures with a realistic fear structure (Rauch and Foa 2006).

Besides that, the dual representation theory which was developed by Brewin, Dalgleish and Joseph (1996) and updated by Brewin and Burgess (2014), proposes that PTSD symptoms are caused by the disturbance of memory processes during the traumatic event. The theory introduces the existence of two separate memory systems which are operating simultaneously. The verbally accessible memory (VAM) system and the situationally accessible

memory (SAM) system. The VAM system consists of context-driven information which is consciously processed and can be voluntarily recalled and described. Contrary to that, the SAM system consists of sensory and emotional information which are processed unconsciously and therefore cannot be voluntarily recalled. The theory suggests that for healthy individuals, both systems are tightly linked and information from the SAM system can be retrieved via access to the VAM system. However, traumatic events can disturb this healthy functioning. During a traumatic event, conscious attention is focused on affective and sensory trauma-related information. Therefore, SAM system information is strongly encoded into memory. Additionally, VAM system information encoding is impaired and the association between SAM system and VAM system is weakened. As a consequence, trauma-related memory is extremely emotion and sensation-focused, and less likely to be retrieved deliberately, but involuntarily. This gives rise to the previously described PTSD symptoms, such as flashbacks or nightmares. For recovery, the theory suggests the integration of the emotional and sensory SAM information and the context-focused VAM information. This can be achieved through a conscious reassessment of the trauma and the attribution of contexts, such as personal responsibility or perceived control. Moreover, the extreme emotional and sensory memories encoded in the SAM system can be attenuated through habituation or cognitive restructuring, by repeated exposure to the traumatic memories (Brewin et al. 1996; Brewin and Burgess 2014).

Finally, the cognitive model, introduced by Ehlers and Clark (2000) focuses on the phenomenon that PTSD symptoms impair the individual, although the traumatic event has already passed. The theory proposes that PTSD develops when individuals process the traumatic event such that it poses a current threat to them. Important for this outcome is the appraisal of the traumatic event and the nature of the trauma memory. First, the appraisal of the traumatic event can be either externally oriented, focused on the world as a safe place, or internally oriented, focused on the person as a competent individual. When the traumatic event is negatively appraised, this can have negative, far-reaching consequences. For instance, a soldier that witnessed a suicide attack and negatively appraises this traumatic event externally may view the world as a dangerous place. As a consequence, the person may avoid open, public spaces. An internally oriented negative appraisal can be for instance thoughts of one's own incompetence, or that one is attracting dangerous situations. Moreover, the negative appraisal can be directed to the trauma sequelae, such as PTSD symptoms and behaviors of others.

For instance, symptoms and others' reactions may be interpreted such that they think that they or others believe that they are permanently impaired. These appraisals can be oriented and focused on different themes and by that impair different areas of life. However, all consequently lead to the perception of a current threat and a generalized, permanent fear. As a consequence, individuals may respond with maladaptive behavioral and cognitive strategies to cope with that fear. For instance, individuals may suppress memories of traumatic events, intake drugs to reduce anxiety, or avoid social contact. However, these coping strategies are nonadaptive and undermine PTSD recovery. Second, Ehlers and Clark (2000) emphasize the importance of trauma memory. Trauma memories are often incomplete in terms of context, time, space, and autobiographical information and therefore difficult to be recalled consciously. Instead, they are extremely vivid, sensational and emotional, and easily triggered by external or internal events. These intrusions of the traumatic event are extremely stressful for the individuals, almost as if they are reliving the traumatic event. Therefore, memories of the traumatic event can reinforce the perception of a current threat. For successful treatment, the theory suggests modification of negative trauma appraisal, a decrease of maladaptive coping strategies, and elaboration and integration of context to the trauma memories (Ehlers and Clark 2000).

Next to these theoretical explanations for the onset and maintenance of PTSD, there are several factors that may impede PTSD recovery. A meta-analysis conducted by Brewin, Andrews and Valentine (2000) reviewed numerous risk factors and highlighted lack of social support as one of the most influential for PTSD maintenance (Brewin et al. 2000). In general, social support is linked to the individual's capacity to adjust and cope with stress (Simon, Roberts, Lewis, Van Gelderen and Bisson 2019). For instance, the social buffering hypothesis suggests that social support attenuates the impairments of overall perceived stress (Cohen and Wills 1985). Therefore, social support may be beneficial for PTSD recovery (Simon et al. 2019). However, many PTSD symptoms, such as emotional numbing, dissociation, or anxiety impede social interactions with close others. Moreover, relatives of PTSD patients usually have difficulties finding an appropriate way of dealing with them. Consequently, PTSD patients may react with social isolation and have a perception of low social support (American Psychiatric Association 2013). As a solution, psychoeducation and social skills training for PTSD patients and relatives may be beneficial (Cloitre, Koenen, Cohen and Han 2002).

As a conclusion, the three most recent and supported theories suggest the consequences of erroneous memory processes and negative self-appraisal as the basis for PTSD development (Brewin and Holmes 2003). Emotional processing theory explains PTSD development and symptomatology in terms of pathological fear structures and meaning-making (Rauch and Foa 2006). In contrast to that, dual representation theory proposes the existence of two separate memory systems, the VAM and the SAM system that may be dysfunctional under traumatic circumstances (Brewin and Burgess 2014). Finally, the cognitive model emphasizes the importance of negative appraisal of the traumatic event and the associated effect on the individual's view on the world and themselves (Ehlers and Clark 2000). For successful treatment, all three theories propose exposure to traumatic memories and the reassessment of beliefs about the self and the world. Besides that, social support has been established as an important factor for PTSD recovery (Brewin et al. 2000; Simon et al. 2019). Therefore, treatment for PTSD should consider these practical implications (Brewin and Holmes 2003; Simon et al. 2019).

3. Psychotherapeutic Approaches to PTSD and Associated Challenges

Current psychotherapeutic PTSD treatment of the German military hospitals do consider the above-mentioned implications for successful treatment. The therapy consists of different first and second-line treatments that are adjusted to the individual needs of the patients (Wesemann, Willmund, Alliger-Horn and Zimmerman 2016).

Successful first-line treatments are eye movement desensitization and reprocessing therapy (EMDR), imagery rescripting and reprocessing therapy (IRRT), prolonged exposure (PE), and cognitive-behavioral therapy (CBT) (Wesemann et al. 2016). EMDR, IRRT, and PE do especially focus on the positive effects of deliberate trauma memory confrontation and reprocessing within a safe therapeutic space. During EMDR, pathological trauma-related memories are activated, while patients rapidly move their eyes from left to right, following a moving object. According to the working memory hypothesis, this dual task execution (recalling the trauma and following the object) divides the visual working memory capacity.

Thereby, imagery is reduced and the traumatic memories are retrieved less emotional and vivid. This decreases the stress response to traumatic memories and enables healthy memory encoding (Landin-Romero, Moreno-Alcazar, Pagani and Amann 2018). Besides that, IRRT focuses on the active rewriting of traumatic memories. First, trauma memories are deliberately evoked and verbalized. Following that, patients are instructed to imagine themselves intervening in the traumatic situation, such that they regain control over the situation. This can enable traumatic memory restructuring, a decrease in the stress response, and an improvement of the individual's world and self-image (Alliger-Horn, Zimmermann and Mitte 2015). Finally, PE focuses on the imagined and actual exposure to trauma-related cues. These can be situations or memories that are harmless but trigger negative responses in the individual. Through repeated exposure to these cues, the negative associations unpair from the stimulus, and the stress response is decreased. Therefore, the individual learns to encounter problematic memories and situations and is less likely to avoid them (Hembree, Rauch and Foa 2003). Next to that, CBT especially focuses on cognitive restructuring. During CBT, the patient's unhelpful thinking patterns and beliefs are identified and replaced with more positive outcomes. Several techniques are utilized to encourage positive, balanced, and effective thinking in contrast to catastrophic and overgeneralized, negative thinking. Moreover, psychoeducation on the effects of traumatic experiences and PTSD is provided and stress management skills and coping strategies are learned. This consequently positively affects the psychological and behavioral outcomes of the patients (Benight and Bandura 2004).

Besides these first-line treatments, numerous second-line treatments are applied in German military hospitals to support PTSD recovery. Examples are sports therapy, ergo therapy, and relaxation sessions. Especially sports and movement programs are greatly accepted among PTSD military personnel and are perceived as effective (Zimmermann, Kowalski, Niggemeier-Groben, Sauer, Leonhardt and Ströhle 2015). Moreover, the social environment of the patients is greatly involved and activated during treatment. There are several possibilities for relatives to communicate and exchange with professionals and affected others. Furthermore, family members of PTSD patients are actively involved in the patient's therapy. Therefore, social support, which is a relevant factor for successful PTSD recovery, is highlighted and promoted during PTSD treatment in German military hospitals (Rose, Zimmermann, Fischer 2016).

In conclusion, the German military hospitals utilize a variety of first and second-line interventions for treating PTSD. The practical implications of the most popular psychological theories (emotional processing theory, dual representation theory, and cognitive model), namely exposure to traumatic memories and cognitive restructuring are represented in treatment (EMDR, IRRT, PE, and CBT) (Wesemann et al. 2016). Moreover, PTSD treatment in German military hospitals considers the importance of social support reinforcement (Rose et al. 2016).

However, although significant effects on PTSD recovery have been achieved with these existing treatments, numerous patients remain with a relevant residual PTSD symptomatology (Wittchen et al. 2013). This may be due to several challenges and barriers that are associated with PTSD treatment of military personnel (Gelkopf et al. 2013). PTSD symptoms such as avoidance, emotion regulation difficulties, and engagement problems may impede therapy engagement and require great effort by the client and therapist (Gelkopf et al. 2013). Furthermore, PTSD military personnel often lack trust in government and military-related institutions, including the healthcare system and military hospitals (Hoge, Castro, Messer, McGurk, Cotting and Koffman 2004). Finally, patients worry that the improvement of their mental health status may reduce their disability payment percentages, or that they may be deployed to dangerous operations again (Frueh, Grubaugh, Elhai and Buckley 2007). These challenges and barriers can negatively impact the patient's therapy engagement and the therapeutic relationship, which are essential for successful treatment. Moreover, they may be responsible for treatment dropout or treatment refusal for some military personnel with PTSD (Steenkamp, Litz, Hoge and Marmar 2015).

Therefore, there is a need for adjustment of the existing first-line treatments for military personnel with PTSD to the related challenges or barriers. Moreover, the exploration of complementary treatment approaches that address these barriers and challenges may be beneficial (Steenkamp et al. 2015). Insights could be employed to improve existing treatments, such as EMDR, IRRT, PE, and CBT. Besides improving existing treatments, complementary treatment approaches could be valuable to help PTSD patients who can not benefit from regular PTSD treatments or refuse regular treatment.

Systemic natural adventure therapy (SANT) may be such a complementary treatment approach, as it may reduce PTSD symptoms while limiting the challenges and barriers that are associated with PTSD treatment for military personnel (Geelkopf et al. 2013).

4. SANT and PTSD

SANT evolved from the idea of experiential learning and consists of activity-based interventions that take place in a natural environment (Herbert 1998). The aim of SANT is to stimulate personal growth and activate self-healing capacities. This is achieved through four interrelated therapy components.

The first component of SANT is the participation of the patients in challenging activities. During therapy, the patients engage in outdoor exercises or activities, such as hiking, camping, or sailing. These activities do often involve smaller tasks that have to be accomplished individually or with the group. The therapist ensures that activities and exercises have an appropriate level of difficulty, namely challenging but achievable. Through mastering challenges, positive experiences are created, self-efficacy is increased and personal growth is stimulated. This consequently positively impacts patients well being and facilitates recovery (Kelley, Coursey and Selby 1997).

The second component of SANT is the integration of the patient's social environment and the group therapeutic approach. The joint participation of patients and their relatives in SANT activities can improve their connection, increase mutual understanding, and facilitate new approaches. This has beneficial effects for the relationship, perceived social support, and consequently on the illness recovery (Riggs 2000). Next to that, participation in SANT activities and exercises together with other patients can improve patients' social skills, create a feeling of community and enable further opportunities for experiencing social support (Kelley et al. 1997).

The third component of SANT is the discussion of SANT activity-related experiences. During SANT, participants make several cognitive, physiological, and psychological experiences (Herbert 1998). Subsequently, participants are asked to elaborate on these experiences, either together with the group or individually with the therapist. This provides the opportunity to reflect on individual difficulties and challenges that may be also present in other life circumstances (Cason and Gillis 1994). Moreover, participants are asked to take a resource-oriented perspective by talking about their strengths, progresses, and future goals. Therefore, a strength-oriented and positive worldview is encouraged (Antonovsky 1987).

Finally, the fourth component of SANT is the natural environment. SANT activities do take place in a natural environment. According to the attention restoration theory, this has several positive effects on the well-being and health of the participants (Kaplan and Kaplan 1989). First, participants leave their familiar environment and disconnect from everyday stress factors ("being away"). Second, the width of natural landscapes can provide a feeling of vastness ("extension"). Third, natural phenomena can provide feelings of deep admiration and awe ("fascination). Fourth, activities in natural environments match human nature and therefore are intrinsically motivating and satisfying ("compatibility"). Through these aspects, natural environments can have beneficial effects on psychological restoration, mental fatigue, and stress (Kaplan and Kaplan 1989).

Together, these four components of SANT (activities, social engagement, reflection, and natural environment) may be beneficial for military personnel with PTSD. Research by Gelkopf et al. (2013) for instance, investigated promising effects of natural adventure therapeutic-based interventions on veteran PTSD recovery. These findings may be due to the applicability of SANT-based components on the previously described theories and research implications for successful PTSD treatment (Brewin et al. 2000; Brewin and Holmes 2003).

The first practical implication provided by recent PTSD theories (emotional processing theory, dual representation theory, and the cognitive model) is the exposure to traumatic memory (Brewin and Holmes 2003). During SANT, participants perform group activities in a natural environment. As military operations most often proceed in the same context, traumatic memories may be triggered automatically during these activities (Gelkopf et al. 2013). Furthermore, the behavioral activation may trigger bodily responses, such as sweating and racing heartbeat that are negatively associated with fear responses (Gelkopf et al. 2013). Therefore, SANT may promote PTSD recovery through exposure to negative and trauma-related stimuli and memories (Brewin and Holmes 2003). Second, PTSD theories suggest cognitive restructuring of the traumatic memories and the negative images of the world and the self (Brewin and Holmes 2003). During SANT, stress responses related to the negative traumatic event may be triggered. However, through positive exposure experiences and subsequent reflection, patients can learn to unbind and regulate their stress responses from harmless situations and cues. Moreover, the achievement of the SANT exercises and challenges may increase participants' self-confidence and efficacy (Gelkopf et al. 2013).

Therefore, PTSD recovery may be stimulated by SANT through cognitive restructuring and the enhancement of a positive self and world image (Brewin and Holmes 2003). Third, lack of perceived social support was established as a major risk factor for PTSD development (Brewin et al. 2000). For SANT, the integration of patients' relatives may promote relationship recovery and improvement processes (Riggs 2000). Furthermore, most SANT-related group activities require cooperation that may lead to group experiences and a feeling of connectedness. Therefore, participants' social skills may improve and opportunities for new social contacts are created. Finally, the group experiences and the shared negative experiences of others may facilitate openness for trauma discussion (Kelley et al. 1997). Therefore, SANT may facilitate PTSD recovery through increased perceived social support (Brewin et al. 2000). Finally, the restoring and stress-relieving effects of the patients' stay in natural environments during SANT may positively impact their reactivity and arousal symptoms, such as agitation or tension (Kaplan and Kaplan 1989). Research by Taheri, Shabani and Ghasemii Sichani (2019) for instance, suggests that natural landscapes can have beneficial therapeutic effects on PTSD recovery.

Besides that, SANT may benefit PTSD recovery by limiting the challenges and barriers that are associated with first-line treatments for PTSD military personnel. The positive effects of SANT on PTSD symptoms such as avoidance, emotion regulation difficulties, and engagement problems may be beneficial for overall therapy engagement for common treatments (Gelkopf et al. 2013). Furthermore, SANT proceeds in a natural environment and may not directly induce government or military-related associations (Gelkopf et al. 2013). Military personnel with PTSD who trust in military or government-related institutions, such as military hospitals, may be more attracted to participate in SANT-related activities compared to conventional first-line treatments (Hoge et al. 2004). The time and the activities experienced together may increase trust-building towards others, therapists, and therapy in general. Therefore, SANT may be an important approach for military personnel with PTSD to continue or enter treatment (Gelkopf et al. 2013). Hence, SANT may be a beneficial complementary approach to improve treatment effects of common treatments for military personnel with PTSD by limiting the associated challenges and barriers (Gelkopf et al. 2013).

In conclusion, SANT does offer several promising opportunities for PTSD treatment in military personnel. The treatment components (activities, social engagement, reflection, and natural environment) may effectively address exposure to traumatic memories, cognitive

restructuring, and perceived social support, that have been proposed by recent PTSD theories and research (Brewin et al. 2000; Brewin and Holmes 2003). Furthermore, the positive effects of natural environments, proposed by the attention restoration theory, can have beneficial effects on PTSD symptomatology (Kaplan and Kaplan 1989; Taheri et al. 2019). Finally, the general appearance and construction of SANT may reduce common treatment challenges and barriers for military personnel with PTSD. Therefore, SANT should be explored as a beneficial complementary approach for treating PTSD in military personnel (Gelkopf et al. 2013).

5. Research Question

PTSD is a disabling and serious disease with great personal, societal and economical consequences (Gelkopf et al. 2013). It is highly represented within the German military personnel population and the amount of German military patients with PTSD is expected to increase within the coming years (Wittchen et al. 2013). Although conventional treatments, such as EMDR, IRRT, CBT, and PE are effectively applied in German military hospitals, some patients remain psychopathological after treatment (Steenkamp et al. 2015; Wittchen et al. 2013). This may be connected to treatment challenges and barriers that are characteristic of military personnel with PTSD and impede treatment progress and recovery (Gelkopf et al. 2013). To overcome these challenges and barriers, existing treatments should be improved and complementary treatments should be explored (Steenkamp et al. 2015). SANT may be such a complementary treatment (Gelkopf et al. 2013). This approach integrates the important implications of recent PTSD theories while limiting the common treatment challenges and barriers for PTSD military personnel. Moreover, the treatment components (activities, social engagement, reflection, and natural environment) may have additional promising effects for PTSD recovery in military personnel (Brewin and Holmes 2003; Gelkopf et al. 2013; Kaplan and Kaplan 1989; Taheri et al. 2019). However, only a few studies have investigated the effects of natural-based adventure therapies for PTSD military personnel (Gelkopf et al. 2013).

Therefore, the research question of the current study is, whether the addition of SANT to treatment as usual (TAU) does decrease PTSD symptoms for military personnel, in comparison to treatment as usual only (TAU) control group and a PTSD symptom pre-test.

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For this purpose, German military personnel with PTSD will be divided into an experimental group (SANT + TAU) and a control group (TAU). PTSD symptoms will be measured in both groups with a pre-and post-test. It is expected that participants in the experimental group (SANT +TAU) have significantly fewer PTSD symptoms after treatment compared to participants in the control condition (TAU) (H1) and the PTSD symptom pre-tests (H2).

6. Method

Due to the COVID-19 measures, it was not possible to conduct the study as intended. Therefore, there are four limitations (L1, L2, L3, L4). These limitations will be thoroughly addressed in the discussion section.

6.1. Participants

Prior to the study, a G*Power power analysis for repeated measures ANOVA with a pre-post measurement and a between-subject factor with two treatment conditions was conducted. Based on the analysis, an amount of 98 individuals was required in the current study to achieve a power of .80. It was intended to study German military personnel from German military hospitals in Ulm, Koblenz, Hamburg, and Berlin. In general, research with German military personnel requires confirmation from the medical service of the German military. However, due to the COVID-19 situation, the medical service of the German military had no capacity to process the application and the German military hospitals were not able to participate in the study. Therefore, participants were gathered from the professional network of the therapists (L1). In total, five participants with a current PTSD diagnosis were gathered for the experimental group. Three participants were military veterans with a PTSD diagnosis who received PTSD treatment. Two participants were nonmilitary personnel with PTSD who received PTSD treatment in a military hospital because of the symptom and trauma similarity to PTSD in the military personnel. Because of that similarity, it was decided to include the two participants in the study. All participants received outpatient PTSD treatment such as EMDR, IRRT, PE, and CBT. Of the five participants, one participant dropped out one week before the intervention and one participant dropped out on the day of the intervention. Therefore, an amount of 3 participants participated in the intervention. However, one participant forgot to fill in the pre-measurement questionnaire. The participant was allowed to participate in the intervention but was excluded from the

analysis. Hence, the experimental group consists of 2 participants (L2). They were both fe-males, with a mean age of 49.5 years. One was single and one was married or lived with a partner. As the German military hospitals did not cooperate in the study, no control group data could be gathered. Therefore, it was decided to utilize the control group from the research of Beetz et al. (2019) (L3). Their control group consisted of 31 male soldiers from German military hospitals with a PTSD diagnosis and a mean age of 38. Seven were single or divorced while 23 were married or lived with a partner. Participants in the control group received TAU, namely EMDR, IRRT, PE, and CBT.

6.2. **Materials & Procedure**

Two days before the intervention, participants in the experimental group received the first online questionnaire (Qualtrics). First participants were provided with an information let-ter to inform them about the purpose of the study. It was emphasized that participation is voluntary and that they can drop out at any time without negative consequences. Partici-pants were asked to give their consent to participate in the study. Following that, questions were asked regarding participants' socio-demographic data, namely age, gender, and fam-ily status. Thereafter, three questionnaires were asked to measure participants' PTSD-related symptoms. To measure depression and anxiety, the Hopkins Symptom Checklist (HSCL) was utilized. It consists of 58 items that can be answered on a four-point Likert Scale, with higher scores indicating more severe symptoms (Derogatis, Lipman, Rickels, Uhlenhuth and Covi 1974). Furthermore, the Perceived Stress Scale (PSS) was utilized to examine the participant's stress level. This questionnaire consists of 14 items that can be answered on a five-point Likert scale with higher scores indicating a higher stress load (Co-hen, Kamarck and Mermelstein 1983). Moreover, the Work and Social Adjustment Scale (WSAS) was utilized to measure functional problems with emotions and actions related to PTSD. This questionnaire consists of 5 items that can be answered on an eight-point Likert scale, with higher scores indicating more problems (Mundt, Marks, Shear and Griest 2002).

Both the control group and the experimental group received TAU, namely EMDR, IRRT, PE, and CBT. The experimental group received an additional SANT intervention for four hours on one specific day. Due to the current COVID-19 situation and the associated measures, the construction of the experimental group intervention (SANT) was conducted online (L4). The researcher and participants met online via Zoom. To create a pleasant and trust-

worthy atmosphere, participants and researchers were asked to introduce themselves, using an object from nature, for instance, a stone, a feather, or a spice that has some personal meaning. Thereafter, the researcher introduced the intervention. Due to the COVID-19 measures, participants performed the intervention on their own and there was no systemic interaction between participants in nature. Participants were asked to enter a nearby natural environment based on their possibilities, for instance, a forest, park, garden, or balcony. They were instructed to take a mindful walk through their natural environment, focusing on their senses and sensations. Furthermore, they were asked to find a place that they feel comfortable with to spend some time. Following that, researchers and participants met again via Zoom. Participants were asked to reflect on their experiences. A resource-oriented perspective was pursued and other participants were invited to react towards each other. Thereafter, the intervention was rounded off and participants were thanked for their participation.

During the days after the intervention, the second questionnaire was sent to the participants. It contained the same information as the first questionnaire. In addition, participants were asked to rank the effectiveness of the SANT components, namely activation, social engagement, reflection, and natural environment. The first ranked component indicated the perceived highest effectiveness and the lowest rank indicated the perceived least effectiveness.

The control group from the research of Breetz et al. (2019) received a pre-and post-measurement of the Hopkins Symptom Checklist (HSCL-25) which is a shorter version of the HSCL, the PSS, and the WSAS. The remaining questions were added and summarized to the variable HSCL25_post. The time point of measurement of the control group is comparable to the time point of measurement of the current study, namely two days before the intervention and during the days after the intervention.

6.3. **Planned Data Processing and Statistical Analyses**

The data was transferred from the online questionnaire to SPSS. The data from the questions regarding participants' socio-demographic data, namely age, gender, and family status were summarized to variables with associated names. The data from the HSCL were added and summarized to the variables "HSCL_pre" (t1) and "HSCL_post" (t2). Furthermore, the data from the PSS were added and summarized to the variable "PSS_pre" (t1) and "PSS_post" (t2) the data from WSAS were added and summarized to the variable

"WSAS_pre" (t1) and "WSAS_post" (t2). The variables HSCL_pre, HSCL_post, PSS_pre, PSS_post, WSAS_pre, and WSAS_post will serve as dependent variables. For exploratory purposes, the data from the SANT component question was transferred to an Excel table where a total choice score was calculated. The pre- (t1) and post-measurements (t2) serve as within-subject factors.

The personal data of participants were analyzed, using descriptive statistics. Because of the extremely small sample size ($N = 2$), it was decided to conduct a paired sample t-test to compare the pre-tests with the associated post-tests. The reason is that t-tests also function properly with extremely small sample sizes (De Winter 2013). Therefore, a paired sample t-test with HSCL_pre and HSCL_post, PSS_pre and PSS_post, and WSAS_pre and WSAS_post was conducted. A p-value < .05 will indicate a significant effect.

To compare the results of the HSCL-25 from Breetz et al (2019) with the results of the HSCL of the current study, the questions from the HSCL that do not appear in the HSCL-25 were excluded. The HSCL-25 questions "Spells of terror or panic" and "Feeling blue" were not represented in the HSCL and therefore left out. The remaining questions were added and summarized to the variable HSCL25_post. As there was no confirmation from the medical service of the German military, the raw data of the control group from Beetz et al. (2019) could not be provided. Therefore, the experimental group post-test means, standard deviation and sample size of the current study were compared to the control group posttest mean, standard deviation, and sample size of Breetz et al (2019) by conducting an independent sample t-test. Therefore, an independent sample t-test was conducted with the experimental group sample size, mean, and standard deviation of HSCL25_post, PSS_post, and WSAS_post and the control group sample size, mean, and standard deviation of HSCL_post, PSS_post, and WSAS_post.

The SANT component questions were transferred to excel and scored based on their rank. A total rank score for each component was calculated.

7. Results

A paired sample t-test was conducted with the variables HSCL_pre and HSCL_post as quantitative within-subject factors (1 - 4), PSS_pre, and PSS_post as a quantitative within-subject factor (1 - 5), and WSAS_pre and WSAS_post as quantitative within-subject factors (1 - 8).

7.1 HSCL

On average, HSCL_pre scores were 31.50 points higher than HSCL_post scores (95%CI[-38.38, 101.38]). There is no significant average difference between HSCL_pre and HSCL_post ($t(1)=5.73$, $p = .110$), indicating that the HSCL mean before the intervention is not significantly different from the HSCL mean after the intervention.

7.2 PSS

On average, PSS_pre scores were 9.50 points higher than PSS_post scores (95%CI[-9.56, 28.56]). There is no significant average difference between PSS_pre and PSS_post ($t(1)=6.33$, $p = .100$), indicating that the PSS mean before the intervention is not significantly different from the PSS mean after the intervention.

7.3 WSAS

On average, WSAS_pre scores were 1.50 points higher than WSAS_post scores (95%CI[-42.97, 45.97]). There is no significant average difference between WSAS_pre and WSAS_post ($t(1)=.43$, $p = .742$), indicating that the WSAS mean before the intervention is not significantly different from the WSAS mean after the intervention.

Furthermore, an independent sample t-test was conducted with group (experimental, control) as between subject factor and HSCL25_post (1 - 4), PSS_post (1 - 5), and WSAS_post (1 - 8) as dependent variables

7.4 HSCL-25_post

The experimental group ($N = 2$, $M = 70.50$, $SD = .707$) scored lower on HSCL25_post than the control group ($N = 31$, $M = 71.40$, $SD = 15.05$). The Hartley test for equal variances is significant ($Fmax = 453.08$, $p < .01$). Therefore, equal variances cannot be assumed. The experimental group is not significantly different from the control group ($t(30.99) = -.33$, p

= .746), indicating that the HSCL-25 mean in the experimental group is not significantly different to the HSCL-25 mean in the control group.

7.5 PSS_post

The experimental group (N = 2, M = 28.50, SD = .707) scored lower on PSS_post than the control group (N = 31, M = 41.77, SD = 3.64). The Hartley test for equal variances is significant ($Fmax$ = 26.51, p < .01). Therefore, equal variances cannot be assumed. The experimental group is significantly different from the control group ($t(6.69)$ = -16.12, p < .001), indicating that the PSS mean in the experimental group is significantly different to the PSS mean in the control group.

7.6 WSAS_post

The experimental group (N = 2, M = 24.50, SD = 4.95) scored lower on WSAS_post than the control group (N = 31, M = 39.16, SD = 8.00). The Hartley test for equal variances is not significant ($Fmax$ = 2.61, p > .05). Therefore, equal variances can be assumed. The experimental group is significantly different from the control group ($t(31.00)$ = -2.54, p < .05), indicating that the WSAS mean in the experimental group is significantly different to the WSAS mean in the control group.

Finally, a total score was calculated for the SANT components ranking with 10 as the highest possible score. Social interaction was ranked as most effective (7), joint reflection was ranked second-highest effective (6), physical activity was ranked third-highest effective (5) and the natural environment was rated least effective (2).

8. Discussion

The current study examined whether the addition of a SANT intervention to TAU does decrease PTSD symptoms for military personnel, in comparison to a TAU control group and a PTSD symptom pre-test. PTSD symptoms were measured on three scales, namely depression and anxiety (HSCL), perceived stress (PSS), and work and social adjustment (WSAS). It was hypothesized that participants who receive the additional SANT intervention have decreased PTSD symptoms after the treatment (H1). The results show no effect of the SANT intervention on participants' PTSD symptoms when comparing their PTSD symptoms

before and after the SANT intervention. That means that the SANT intervention did not reduce PTSD-related symptoms of depression and anxiety, perceived stress, and work and social adjustment. Therefore, the hypothesis (H1) is rejected. Besides that, it was hypothesized that participants who received the additional SANT intervention have reduced PTSD symptoms compared to the TAU control group (H2). The results show no effect for the SANT intervention on PTSD related symptoms of depression and anxiety compared to the TAU control group. However, the results show an effect of the SANT intervention on PTSD-related symptoms of perceived stress and work and social adjustment. That means that an additional SANT intervention is not effective with regards to PTSD-related symptoms of depression and anxiety, but effective with regards to PTSD-related symptoms of perceived stress and work and social adjustment. Therefore the hypothesis (H2) is retained. Besides that, participants were asked to rank the components of the SANT intervention, based on their perceived effectiveness. The results show that participants rated social interaction, joint reflection, physical activity, and the natural environment from high to low respectively.

These results are contradictory to the findings of Gelkopf et al. (2013). In their research, they investigated an improvement of military personnel's PTSD symptoms, such as post-traumatic stress symptoms, depression, sense of control over PTSD symptoms, and quality of life, after a natural adventure therapy treatment (Gelkopf et al. 2013). The differences in findings may be due to the differences in study construction between the present research and the research of Gelkopf et al. (2013). Whereas the current study performed one single SANT intervention, Gelkopf et al. (2013) performed several natural adventure therapeutic interventions on a weekly basis over a one-year period. Therefore, prolonged SANT treatment may be required for the treatment to be effective. Furthermore, there are several limitations in the current study that may have caused the difference in finding between the present research and the research of Gelkopf et al. (2013). These limitations will be addressed later during the discussion section.

Besides that, Gelkopf et al. (2013) investigated the effects of natural adventure therapy for military personnel with PTSD compared to a waiting list control trial of military personnel with PTSD. These findings are in line with the results of the current study, as PTSD symptoms after an additional SANT intervention significantly improved compared to a TAU control group. Therefore, SANT may be a beneficial addition to TAU, compared to TAU only.

This may be due to the applicability of the SANT components (social interaction, joint reflection, physical activity, and the natural environment) to recent theories for successful PTSD treatment, such as emotional processing theory, dual representation theory, and the cognitive model (Ehlers and Clark 2000; Brewin and Burgess 2014; Rauch and Foa 2006). These theories suggest exposure to traumatic memories, cognitive restructuring of the traumatic memory, and improvement of perceived social support (Brewin and Holmes 2003; Brewin et al. 2000). The SANT component of social interaction was perceived as most effective by participants of the current study. During therapy, participants were encouraged to share and discuss their experiences. This may have increased perceived social support and thereby decreased PTSD symptomatology (Brewin et al. 2000). Besides that, joint reflection was perceived as the second most effective. The participants jointly reflected on their experiences together with the therapist. Feedback was provided and a resource-oriented perspective was taken. This may have increased perceived social support, cognitive restructuring of the traumatic memory, and increased self-confidence and efficacy (Gelkopf et al. 2013).

Finally, physical activity and the natural environment were perceived as the third and least effective. Participants were instructed to take a mindfulness walk through a natural environment. This may have induced exposure to traumatic memories, as military operations most often also proceed in natural environments and involve physical activities (Gelkopf et al. 2013). Furthermore, making positive experiences in that environment may facilitate cognitive restructuring (Gelkopf et al. 2013). Finally, the restorative effects of nature may have reduced PTSD-related stress symptoms and thereby contribute to the effects of the additional SANT intervention (Kaplan and Kaplan 1989; Taheri et al. 2019). Besides that, the additional SANT intervention may have reduced the treatment challenges and barriers that are associated with TAU treatment for military personnel PTSD, such as symptoms of avoidance, emotion regulation difficulties, and engagement problems or through a trustworthy and non-governmental or military-related environment (Gelkopf et al. 2013). Therefore, the SANT component's applicability to recent PTSD treatment suggestions and its challenges and barriers limiting capacities may be responsible for the finding that an additional SANT intervention was more effective in reducing PTSD symptoms for military personnel compared to TAU only. However, these interpretations need to be considered with caution, as there were several limitations in the current study.

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Due to the COVID-19 pandemic and the associated measures, there were several research challenges that required adjustment to the circumstances. These adjustments contributed to four limitations (L1, L2, L3, L4) which are important to consider while interpreting the findings.

The first limitation was that the participants were gathered from the professional network of the researchers and not from German military hospitals (L1). The reason was that no research approval was provided because of limited capacities in the military hospitals due to the COVID-19 pandemic. As a consequence, participants were informed about the study purpose, deliberately chose to participate in the experimental condition, and no randomization of groups was possible. Accordingly, the results may be biased and alternative explanations are possible. For instance, participants may have prior SANT experiences, a preference for alternative therapy approaches, or a belief in the restorative effects of nature. Therefore, the experimental group may not be representative of the overall population of military personnel with PTSD.

In connection to this, the second limitation is that no control group could be gathered and the control group data from Beetz et al. (2019) was utilized (L2). The reason was that no study approval was provided from the sanitary services of the German military due to the COVID-19 pandemic and German military hospitals were not allowed to collaborate in the study to set up a control group. As a consequence, the control group of Beetz et al. (2019) was utilized. As their study was performed two years before the current study, there are several possible alternative explanations for the investigated effect of the additional SANT intervention group compared to the TAU control group. For instance, the COVID-19 pandemic was not present during the research of Beetz et al (2019) and related factors may be possible alternative explanations. Besides that, the control group data of Beetz et al. (2019) was gathered from military personnel with PTSD hospitalized in German military hospitals. In comparison to that, the experimental group of the current study consisted of military personnel with PTSD who received ambulant treatment. Consequently, participants in the experimental condition may not have required stationary treatment and their overall PTSD symptomatology might be below the PTSD symptomatology of the control group. This may be a possible alternative explanation for the effect of the additional SANT intervention compared to the control group, as differences between experimental and control group may not be attributed to the additional SANT intervention but to prior differences in PTSD

symptomatology between the groups. Therefore, the control group may not be representative for the experimental group and alternative explanations for the differences between the groups are possible.

In relation to that, the third limitation of the study is the extremely small sample size. The first reason for the reduced sample size was that no study approval was provided from the sanitary services of the German military due to the COVID-19 pandemic. Therefore, German military hospitals were not allowed to collaborate in the study to set up an experimental group. Hence, participants had to be gathered from the professional environment of the researchers which dramatically decreased participant amount because of the specific inclusion criteria (German military personnel and a PTSD diagnosis). The second reason for the extremely small sample size was the high dropout rate of the research sample. In general, psychological research on PTSD suffers from a high drop-out and non-response rate, which is related to PTSD symptomatology (Schottenbauer, Glass, Arnkoff, Tendick and Gray 2008). As a consequence, power of .80 could not be reached and chances are high that outcomes were distorted by a random or systematic error (Cohen 1977). Although investigations of De Winter (2013) suggest that studies with extremely small sample sizes can produce meaningful results using a t-test analysis, there are major implications associated with small sample sizes that may have affected the results of the current study. Research with small sample sizes have increased standard errors, wider 95% confidence intervals and consequently imprecise estimates of the effects. Therefore, the probability for the occurence of a type I error (false positive) and a type II error (false negative) is increased (Hackshaw 2008). This may have implications on the findings of the current study. Results yielded that no effects for participants' PTSD symptoms in the SANT intervention group were found, comparing their PTSD symptoms before and after the intervention. These findings may be false negative, as they were obtained based on a small sample size. Furthermore, results yielded effects for participants who received the additional SANT intervention compared to the TAU control group. These findings may be false positives, as they were obtained based on a small sample size. Therefore, replicating the study with a sufficiently large sample size may yield different results. Hence, the sample of the current study is possibly not representative of the general population as it may lack external reliability (Cohen 1977).

Finally, the fourth limitation is that the SANT intervention was performed in an online format and not in person (L4). Due to the COVID-19 pandemic and the associated measures,

an in-person meeting for the SANT intervention was not feasible during the time period of the study. Therefore, some SANT components had to be adjusted. For instance, interaction with the other participants proceeded online via Zoom. Therefore, there was no systemic in-person interaction between the participants which may reduce participants' perceived social support (Bailenson 2021). Hence, online SANT components may not be as effective as in-person SANT components. This can be an alternative explanation for the findings that the additional online SANT intervention had no effect on PTSD symptoms in the experimental group. Besides that, the online format required the participants to video chat via Zoom. Technical difficulties, distance in space, and the overload of nonverbal cues may have caused Zoom fatigue in the participants, a condition of stress and fatigue because of the characteristics of a video chat (Bailenson 2021; Jiang 2020). Hence, Zoom fatigue may have undermined the effects of the SANT intervention. This can be another alternative explanation why no effect was found for the additional SANT intervention on participants' PTSD symptoms in the experimental group. Therefore, online SANT intervention may not be representative and as effective as an in-person SANT intervention. Concluding, these four limitations may have impacted the research findings and should be considered when interpreting the results.

Therefore, future research is recommended to investigate the effectiveness of an additional SANT intervention on military personnel PTSD while controlling for these limitations. Little research has been conducted within that field yet and there are several further recommendations for future research. First, future studies should investigate the effects of additional SANT on military personnel PTSD symptoms over a long-term period. This may provide insights into the ideal duration of an additional SANT intervention. Furthermore, future studies should investigate the underlying effects of SANT by examining the effectiveness of the four components (social interaction, joint reflection, physical activity and the natural environment). In that context, the effectiveness of SANT should be investigated based on the common treatment challenges and barriers known for military personnel PTSD and TAU. Moreover, differences in effectiveness between online SANT and in-person SANT should be investigated. Following that, future research should broaden up and examine the effectiveness of additional SANT on PTSD for non-military personnel and other psychological diseases. Finally, future studies should explore the effectiveness of different types of SANT activities (mindfulness walk, hiking, climbing, etc.) combined with different natural environments (mountains, woods, sea, etc.).

9. Conclusion

Military personnel PTSD is a complex disease with far reaching individual, societal and economic consequences (Gelkopf et al. 2013). For successful treatment, recent theories (emotional processing theory, dual representation theory, cognitive model) suggest the exposure to traumatic memories and the reassessment of beliefs about the self and the world (Ehlers and Clark 2000). Furthermore, social support has been investigated as a beneficial factor for PTSD recovery (Brewin et al. 2000; Simon et al. 2019). Although these suggestions are applied in existing first-line treatments for military personnel PTSD (EMDR, IRRT, PE, and CBT) some patients remain with significant residual symptomatology (Wittchen et al. 2013; Wesemann et al. 2016). One reason may be the treatment barriers and challenges that are associated with military personnel PTSD and TAU (Frueh et al. 2007; ; Gelkopf et al. 2013; Hoge et al. 2004; Steenkamp et al. 2015). Therefore, a complementary treatment approach is required that addresses these barriers and applies to the recent PTSD theories (Steenkamp et al. 2015). SANT may be such an approach and was therefore investigated in the current study. Results yielded no effects of the additional SANT intervention on participants' PTSD symptoms in the experimental group after the treatment, compared to their PTSD symptoms before the treatment. However, the comparison of the SANT experimental group with a TAU control group yielded a significant effect of the additional SANT intervention on military personnel's PTSD symptoms. Therefore, SANT may be an effective complementary approach to existing first line treatment for military personnel with PTSD. As the study was constructed and performed during the COVID-19 pandemic, there were four major limitations that should be considered when interpreting the results. Nevertheless, the current study raised awareness on the complexity of military personnel PTSD and the importance of finding successful additional treatment approaches. Moreover, it set a cornerstone for future investigations towards such additional treatment approaches. Future studies are required to further extend the knowledge and find successful treatment for military personnel PTSD.

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Remarks

Literature

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