



A Resource Building Virtual Care Programme: improving symptoms and social functioning among female and male rural veterans

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ABSTRACT

Background: Veterans have higher rates of PTSD and depression compared to the general population and experience substantial functional impairment. Impairment in social functioning has been a significant concern among Veterans, particularly rural Veterans, who have limited access to mental health care and are at risk for social isolation.

Objective: A mixed-method study was implemented to evaluate the feasibility and effectiveness of webSTAIR, a web-based skills training programme, paired with home-based telehealth sessions. It was hypothesized that the programme would lead not only to reductions in PTSD and depression but also to improvements in social functioning.

Method: Participants were 80 trauma-exposed Veterans enrolled in rural-serving VHA facilities with clinically elevated symptoms of either PTSD or depression. The study directed substantial outreach efforts to rural women Veterans and those who have experienced military sexual trauma (MST).

Results: Significant improvements were obtained with PTSD and depression symptoms as well as in social functioning, emotion regulation, and interpersonal problems at post-treatment and 3-month follow-up. Ratings of therapeutic alliance were high as were reports of overall satisfaction in the programme. There were no differences by gender or MST status in symptom outcomes or satisfaction.

Conclusions: The results support the feasibility and effectiveness of this integrated telehealth web-based skills training programme for both male and female Veterans as well as for those with and without MST. The focus on resource building and improved functioning make this programme of particular interest. Further testing is warranted.

Un modelo de atención virtual de desarrollo de recursos: Mejora los síntomas y el funcionamiento social de los veteranos, hombres y mujeres, de zonas rurales.

Antecedentes: Los veteranos tienen tasas más altas de TEPT y depresión en comparación con la población general y experimentan un deterioro funcional sustancial. El deterioro del funcionamiento social ha sido una preocupación importante entre los Veteranos, particularmente los Veteranos rurales, que tienen acceso limitado a la atención de salud mental y están en riesgo de aislamiento social, lo que contribuye significativamente a problemas de salud.

Objetivo: Se implementó un estudio de método mixto para evaluar la viabilidad y efectividad de webSTAIR, un programa de capacitación en habilidades basado en la web, combinado con sesiones de tele salud en el hogar. Se planteó la hipótesis de que el programa conduciría no solo a reducciones en el trastorno de estrés postraumático y la depresión, sino también a mejoras en el funcionamiento social.

Método: Los participantes fueron 80 Veteranos expuestos a traumas inscritos en el sistema VHA de servicio rural, con síntomas clínicamente elevados de TEPT o depresión. El estudio dirigió importantes esfuerzos de divulgación a las mujeres rurales Veteranas y aquellas que han experimentado un trauma sexual militar (TSM).

Resultados: Se obtuvieron mejoras significativas con el TEPT y los síntomas de depresión, así como en el funcionamiento social, la regulación de las emociones y los problemas interpersonales en el postratamiento y en el seguimiento a los 3 meses. Las puntuaciones de la alianza terapéutica fueron altas, al igual que los informes de satisfacción general en el programa. No hubo diferencias por sexo o estado de TSM en los resultados de los síntomas o la satisfacción.

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关键词

农村退伍军人; MST; 在线创伤治疗; 远程心理健康; PTSD; 社会功能; 人际关系问题; 情绪调节

HIGHLIGHTS

An online skills intervention, webSTAIR, paired with home-based telehealth sessions delivered to rural Veterans was effective in improving not only symptoms of PTSD and depression but also social functioning, a critical part of trauma recovery.

Conclusiones: Los resultados respaldan la viabilidad y efectividad de este programmea integrado de capacitación en habilidades de telesalud basado en la web para veteranos masculinos y femeninos, así como para aquellos con y sin MST. El enfoque en el desarrollo de recursos y la mejora del funcionamiento hace que este programmea sea de especial interés. Se requieren nuevos estudios.

一个资源建设型虚拟护理模型：改善农村男女退伍军人的症状和社会功能

背景: 与一般人群相比, 退伍军人具有更高的PTSD和抑郁流行率, 并且会遭受严重的功能损伤。社会功能损伤一直是退伍军人的突出问题, 特别是农村退伍军人, 他们获得心理健康护理的机会有限, 并且有遭受社会孤立的风险, 这是导致健康问题的一个重要原因。

目的: 进行混合方法研究, 以评估一种结合家庭远程医疗课程的网络技能培训计划——webSTAIR的可行性和有效性。根据假设, 此计划不仅会减轻PTSD和抑郁, 也会改善社会功能。

方法: 参加者为80名遭受创伤且在农村VHA设施中登记为PTSD或抑郁临床症状升高的退伍军人。本研究大范围拓展至农村女性退伍军人和遭受军队性创伤 (MST) 者。

结果: 治疗后和3个月的随访中, PTSD和抑郁症状以及社会功能, 情绪调节和人际关系问题均得到了显著改善。该计划的治疗联盟评价很高, 总体满意度报告也很高。症状结果或满意度在性别或MST状态方面没有差异。

结论: 结果支持了这种网络远程医疗综合技能培训计划对男女退伍军人以及有无MST者的可行性和有效性。对资源建设和功能改善的关注使该计划特别受关注。有必要进行进一步考查。

Exposure to traumatic events is extremely common with nearly 75% of individuals reported to have experienced one or more traumatic events (Kessler et al., 2017). The ubiquity of trauma exposure and its consequences, particularly posttraumatic stress disorder, depression, and functional impairment, lead to considerations about how to provide effective interventions that can be widely and easily disseminated. Use of technology such as web-based interventions and video-delivered therapies has the potential to increase access to care and resolve barriers to treatment, including geographical and logistical challenges as well as the absence of expert service providers and appropriate treatment settings (Olthius et al., 2016; Reger & Gahm, 2009; Shore, Goranson, Ward, & Lu, 2014). This study evaluated the feasibility, satisfaction, and effectiveness of an online intervention programme supported by video-coaching sessions for U.S. rural Veterans with special attention to women Veterans. Thus far, trauma-focused web-based interventions have demonstrated success in reducing PTSD symptoms with effect sizes in the moderate range (Lewis, Roberts, Simon, Bethell, & Bisson, 2019). This study investigated a web-based skills training intervention intended predominantly to improve functioning. This approach may serve as a complement or alternative to trauma-focused interventions particularly among those with chronic trauma exposure who are at risk for substantial functional impairment.

Repeated exposure to chronic and different types of traumatic stressors is associated with increasingly severe PTSD, greater depression, and greater functional impairment (Kessler, 2000). Veterans represent a segment of the U.S. population with high rates of trauma, including those which tend to be of a repeated

and chronic nature. Compared with civilians, those with military service not only have higher rates of lifetime traumatic exposures in adulthood, which includes military-related exposure (Lehavot et al., 2018) but also report higher rates of childhood verbal, physical and sexual abuse as well as nearly all forms of adverse childhood events including household dysfunction and neglect (Katon et al., 2015). It is not surprising that lifetime rates of PTSD are substantially higher in Veterans than civilians among both men (7.7% versus 3.4%, respectively) and women (13.4% versus 11.7%, respectively) (Lehavot, Katon, Chen, Fortney, & Simpson, 2018).

This investigation had a particular interest in enrolling women Veterans. They are the fastest growing subpopulation within the U.S. Veteran community and the fastest growing utilizers of health services (National Center for Veterans Analysis and Statistic, 2017). They also experience a particular and relatively unique type of traumatic stressor, military sexual trauma (MST), defined as sexual assault or severe or threatening forms of sexual harassment during military service. While both men and women Veterans experience MST, this trauma type occurs in much higher rates amongst women Veterans (Maguen et al., 2012). Women Veterans who have experienced MST tend to report higher rates of trauma across the life span including childhood abuse and maltreatment (Sadler, Booth, Cook, & Doebbeling, 2003), have higher rates of PTSD, depression, and functional impairment compared to Veterans who have not experienced MST (Maguen et al., 2012), and report lower social support and greater stigma than other Veterans (Skinner et al., 2000; Suris & Lind, 2008).

Veterans and particularly women Veterans have expressed concerns about social functioning (Kelly,

Skelton, Patel, & Bradley, 2011; Pietrzak et al., 2010; Skinner et al., 2000; Suris & Lind, 2008). Notably, trauma-focused therapies provide relatively limited improvement in social functioning among Veterans (e.g. Bosch et al., 2020; Holliday, Williams, Bird, Mullen, & Suris, 2015; Monson et al., 2012; Schnurr et al., 2007; but see Monson et al., 2006). Programmes that provide direct attention to these problems may increase interest in and engagement into treatment as well as improve outcomes in social functioning. Several studies have indicated that the relationship between trauma-related symptomatology and social functioning is dynamic and reciprocal. For example, symptoms of PTSD and depression each contribute to impaired social functioning (Wingo et al., 2017). However, impaired social functioning, independent of symptoms of depression and PTSD creates risk for recurrence of depression and return for further treatment of PTSD (Fontana & Rosenheck, 2010; Vittengl, Clark, & Jarrett, 2009). The results of these studies have led to recommendations for psychotherapeutic interventions that address problems in social functioning as a way of improving the overall health and well-being of veterans and minimizing need for recurrent care (Fontana & Rosenheck, 2010; Tsai, Harpaz-Rotem, Pietrzak, & Southwick, 2012).

Interventions which focus on social functioning might have particular benefit to rural Veterans who represent approximately 40% of U.S. Veterans (Tanielian, Tanielian, & Jaycox, 2008). Social isolation has long been a theme in discussions about the well-being of Veterans, who may experience challenges in integrating themselves into a social environment and building or maintaining social relationships and social networks due to unique features of military service. These include a number of role and geographic transitions and military-related traumas which may be perceived as not easily or well understood by those outside of the military (see Wilson, Leslie, McGill, & Kiernan, 2019). Social isolation is associated with poor mental health, poor physical health, and early mortality (Holt-Lunstad, Smith, & Layton, 2010; Wilson, Hill, & Kiernan, 2018). Moreover, there is some evidence that individuals who live in rural areas experience more social isolation than their urban counterparts (Baernholdt, Yan, Hinton, Rose, & Mattos, 2012; but see Havens, Hall, Sylvestre, & Jivan, 2004). While rates of PTSD and depression between rural and nonrural Veterans are equivalent, access to care is substantially reduced for those in rural areas. This health disparity as well as risk for social isolation may be resolved through technology-supported mental health programming that provides coping skills which not only help manage PTSD and depression but also improve social functioning and engagement.

Accordingly, we implemented an online programme, webSTAIR, based on Skills Training in Affective and Interpersonal Regulation (STAIR), a skills training programme that focuses on improving overall functioning via improving emotion regulation and interpersonal skills (see Cloitre, Cohen, Ortigo, Jackson, & Koenen, 2020). Lower levels of these capacities among trauma-exposed populations have been identified as contributors to social impairment (Cloitre, Miranda, Stovall-McClough, & Han, 2005) as well as to symptoms of PTSD and depression (Cloitre et al., 2019). A recent randomized controlled trial study of STAIR delivered face-to-face in primary care indicated that the treatment provided significant reductions in social impairment as well as PTSD and depression with large effect sizes obtained for all outcomes (Jain et al., 2020). Our goal was to assess whether webSTAIR would be effective in positively impacting this full range of symptoms and problems.

We piloted the webSTAIR programme combined with video telehealth support. WebSTAIR sessions were conducted such that the Veteran completed a module of webSTAIR guided by a clinician who provided coaching via video in real time. The decision to include a coach was based on the literature indicating that clinician-guided programmes increase engagement, reduce attrition, and achieve substantially larger effect sizes than self-guided programmes (Baumeister, Reichler, Munzinger, & Lin, 2014; Spek, Nyklíček, & Keyzer, 2007). The decision to have the Veteran engage in the webSTAIR intervention concurrently with video coaching was based on the success of Coordinated Anxiety Learning Management (CALM), a programme in which a trained provider reviews the material from a web-based programme session by session with the patient in person (Craske et al., 2011). Our plan was based on the CALM delivery formulation but differed in that the 'face-to-face' work with the Veteran would be completed via video telehealth, resulting in the simultaneous use of two different technologies to create a high resource but entirely virtual intervention programme.

This evaluation project was funded by the Veterans Health Administration (VHA) Office of Rural Health and was committed to enrolling Veterans across facilities that were rural serving and particularly to rural women Veterans with MST, who tend to have limited access to care, suffer from high rates of PTSD and depression, and who express concerns about poor social support, social isolation and social functioning. Therefore, our interest was to assess the acceptability and benefits of the webSTAIR programme among female and male rural Veterans. The project used a mixed-methods approach to meet three goals which were to (1) identify whether webSTAIR would be effective in improving PTSD and depression, (2) identify whether the

programme would improve functioning, particularly social functioning and the related outcomes of emotion regulation and interpersonal skills, and (3) assess feasibility and satisfaction with the programme.

1. Method

1.1. Procedure

All procedures involved in the evaluation were reviewed and exempted by the local academic institutional review board. Nine VHA facilities participated in the programme. In order to be accepted as a programme site, the facility was required to have demonstrated enrolment of Veterans located in areas designated as rural according to U.S. census records. The facility was also required to have in place either a Women's Mental Health or MST coordinator interested in enrolling women Veterans into the programme. Outreach activities conducted by each site included sending flyers to clinicians, advertising the study in local VHA hospitals and Vet Centres, and presenting to clinicians and Veterans at community events and at community-based outpatient clinics (CBOCs).

At each site, a mental health provider was designated as a webSTAIR coach and conducted the intervention from their office or home, equipped with secure video telehealth equipment. Veterans completed their video sessions in their home or at a private location (e.g. office). They connected using their own device and internet service, or if needed were provided with a VHA-issued cellular serviced tablet or iPad when they lacked appropriate equipment or did not have reliable internet service. Participants were compensated for time spent completing assessments with payments of gift cards of 30 USD at baseline assessment, 20 USD at mid-treatment, and 50 USD at posttreatment and 3-month follow-up.

1.2. Participants

Participants were 80 Veterans who were enrolled in VHA facilities that served rural patients. Veterans were referred via clinician referral or self-referral. Potential participants were given a brief eligibility screener over the phone. Individuals were eligible for inclusion if they reported a history of trauma exposure and were currently experiencing PTSD and/or depression symptoms as indicated by a positive screen on the PC-PTSD (Prins et al., 2004) or the two-item Patient Health Questionnaire PHQ-2 (Kroenke, Spitzer, & Williams, 2003). This screening approach was taken as it is consistent with general practice in the VA and which we expected would provide us with participants with a wide range

of PTSD and depression scores. Additional inclusion criteria were an expressed willingness to complete assessment and treatment procedures, and an interest in working on improving emotion regulation skills and interpersonal relationships. Exclusion criteria were active suicidal or homicidal ideation, psychosis, mania, cognitive impairment, inability to attend regular telemental health (TMH) appointments, primary substance or alcohol use difficulties, current interpersonal violence (IPV), lack of a private place to connect for sessions, engagement in concurrent trauma focused treatment for PTSD, and receipt of inpatient or residential PTSD care in the past year. Although the target populations for enrolment into the study were rural Veterans and women Veterans, any Veteran who satisfied the above criteria and could not easily access in-clinic care (e.g. health concerns, time constraints, elder or childcare responsibilities) was accepted into the programme.

1.3. Coaches

WebSTAIR coaches were all licenced mental health staff working in VHA clinics. Six were licenced clinical psychologists, three were licenced social workers, and one a licenced professional mental health counsellor. All therapists were women. Training included in vivo demonstrations of webSTAIR's ten modules as well as discussion around unique issues related to the use of web-based technology in comparison to traditional face-to-face psychotherapy. All coaches attended weekly group phone supervision sessions with an experienced clinical psychologist and certified STAIR trainer, as well as weekly implementation meetings to address questions and concerns related to implementing a web-based telemental health intervention.

1.4. Intervention

The webSTAIR programme consists of ten web-based modules, adapted from STAIR (Cloutre et al., 2020). The first five modules review emotional awareness, emotion management, and distress tolerance while the final five modules raise awareness about relationship patterns and provide interpersonal skills training regarding effective assertiveness, interpersonal flexibility, and compassion for self and others. Modules include text, video, and audio delivery of psychoeducation, as well as interactive exercises and worksheets to aid the patient in learning and practicing the material. Coaches met with Veterans weekly over video teleconferencing and went through the module alongside the Veteran using screen sharing. Between coaching sessions, Veterans were encouraged to log on to their webSTAIR portal to review the material, and practice the skills taught in each module.

1.5. Measures

All symptom assessments were completed by the assessment coordinator via telephone at pretreatment, midpoint (session 5), posttreatment, and 3-month follow-up. The initial assessment included an inquiry about frequency of traumatic events using an adapted version of the Life Events Checklist for the Diagnostic & Statistical Manual, Fifth Edition (LEC-5; Weathers et al., 2013a) which included three additional items regarding the experiences of childhood sexual abuse, childhood physical abuse and neglect. Semi-structured exit interviews were conducted at posttreatment.

1.5.1. PTSD symptoms

Posttraumatic stress disorder symptom severity was measured by the PTSD Checklist for DSM-5 (PCL-5; Weathers et al., 2013b). The PCL-5 is a 20-item self-report measure that asks participants to rate items on a scale of 0 (not at all) to 4 (extremely) in terms of how much they have been bothered by each symptom in the past month. Responses were summed to create a total score, with higher scores indicating more severe PTSD symptoms. Cronbach's alpha for this sample was 0.91.

1.5.2. Depression

Depression symptoms were measured by the Patient Health Questionnaire (PHQ-9, Kroenke, Spitzer, & Williams, 2003). The PHQ-9 is a 9-item self-report measure that asks participants about symptoms that may have bothered them in the past two weeks. Participants rate each item according to the number of days each item bothered them on a scale of 0 (not at all) to 3 (nearly every day). Responses were summed to create a total score with higher scores indicating worse depression. Cronbach's alpha for this sample was 0.83.

1.5.3. Emotion regulation

Total score on the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) was used to measure emotion regulation. The DERS is 36-item measure that asks participants to rate items on a scale of 0 (almost never) to 5 (almost always). Responses were summed to create a total score with higher scores indicating greater emotion regulation difficulties. Cronbach's alpha for this sample was 0.92.

1.5.4. Interpersonal problems

Interpersonal problems were measured using the short version of the Inventory of Interpersonal Problems (IIP-32, Barkham, Hardy, & Startup, 1996). The IIP-32 is a 32-item self-report measure that asks participants to rate items on a scale of 0 (not at all) to 4 (extremely). The measure is comprised of

eight subscales which asks the respondents about problems they have being appropriately assertive, open, caring, involved, supportive of and dependent on others. Responses were averaged to create a mean score with higher scores indicating greater interpersonal difficulties. Cronbach's alpha for this sample was 0.76.

1.5.5. Social functioning

Overall and social functioning was measured using an abbreviated version of the World Health Organization Disability Assessment Schedule 2.0 (WHODAS-2.0; World Health Organization, 2010). Three subscales were eliminated because they were not relevant to the problems of this sample (basic cognitive functioning, basic self-care, and physical mobility). The remaining 21 items were included in this abbreviated version of the WHODAS-2.0 (AWHODAS-2.0) to assess overall functioning. Three subscales were reviewed to distinguish between social functioning and completing daily tasks. Social functioning was assessed by the 4 item Getting along with People subscale (e.g. making friends and maintaining relationship) and the 4-item Participation in Society subscale (e.g. joining in community activities, feeling supported by others, engaging in pleasurable activities). Completion of daily tasks was assessed by the 8-item Life Activities subscale (getting household, job or schoolwork tasks done). Participants were asked to rate items on a scale of 0 (none) to 4 (extreme or cannot do) regarding how difficult the activities were to complete. Responses were summed to create a total score, with higher scores indicating greater difficulties. The Cronbach's alphas for this sample were 0.90 for the overall AWHODAS-2 score, 0.73 for the Getting along with People subscale, 0.70 for Participation in Society subscale, and 0.95 for the Life Activities Subscales.

1.5.6. Therapist alliance

Therapist alliance was measured with the Working Alliance Inventory – Patient Version (WAIP; Horvath & Greenberg, 1989). The WAIP is a 12-item measure that assesses the patient's views regarding three dimensions of the treatment: attending to appropriate tasks (tasks), working towards shared goals (goals), and rapport and bond between therapist and veteran (bond). The WAIP was collected mid-treatment (after coaching session 5) and posttreatment. Participants were asked to rate items on a scale of 1 (never) to 7 (always). Responses were averaged to create a mean score with higher ratings indicating greater working alliance.

1.5.7. Treatment satisfaction and feasibility

Patient satisfaction was assessed using a semi-structured exit interview developed for this study. The interview included open-ended questions about participants' experiences with the webSTAIR

programme as well as close-ended queries with Likert scale responses. Participants were asked to rate the extent to which the webSTAIR programme met their needs on a scale ranging from 1 (met none of my needs) to 4 (met all of my needs). They also rated the importance of seeing their coach via video and the importance of going through the webSTAIR modules with their coach on a scale ranging from 1 (not at all important) to 3 (very important).

1.6. Data analytic plan

Study completers were defined as those who completed the post and/or 3-month follow-up assessment. Prior to conducting outcome analyses, we compared completer and non-completer subgroups on demographic variables using chi-square analyses and independent samples *t*-tests. A series of chi-square tests were used to examine differences between males and females in exposure to 17 separate traumatic events and an independent samples *t*-test was used to examine differences between males and females in total number of exposures to traumatic events (possible range 0–17).

Change in each outcome (i.e. PCL-5, PHQ-9, DERS, IIP-32, and the AWHODAS-2.0 and three of its subscales) over time was first examined using unconditional linear growth models (PROC MIXED in SAS version 9.4). Eight models were conducted, each with the outcome as the dependent variable and with time as the sole predictor. Both intercept and time were specified as random effects in all models. Time was coded such that pretreatment received a value of 0, which represents the average value on the outcome at pretreatment, to aid in interpretation of the intercept. An additional series of eight conditional linear growth models were then conducted with the gender by time interaction followed by another series conducted with MST by time interaction. The MST interaction effect was assessed as more than half of the sample across both male and female participants had experienced MST. Significant interaction effects would indicate that the slope in change in the outcome over time varied by gender or by MST status. All analyses were intention-to-treat (ITT) and used the Proc MI and MIANALYZE multiple imputation procedures in SAS to address missing data. Simulations specified 50 imputations and demonstrated good relative efficiency for effect estimates. Effect sizes (Cohen's *d*) were calculated in order to examine the magnitude of symptom change from pretreatment to post and from pretreatment to the 3-month follow-up where effect sizes of 0.2, 0.5 and 0.8 indicate small, medium and large effects, respectively (Cohen, 1988).

Means and standard deviations were calculated to describe total therapist alliance at midpoint and post

assessment. Treatment satisfaction and feasibility data were summarized using rapid qualitative data analytic techniques, an inductive analytic approach based on the methods of Sobo, Simmes, Landsverk, and Kurtin (2003) and Curran et al. (2011). Rapid analysis is a process of data condensation that is systematic and rigorous and is used when qualitative data need to be quickly analysed to inform real-time implementation of the intervention. Qualitative coding and analysis were completed by a clinical psychologist and a master's-level research assistant with substantial qualitative experience. Summaries of individual responses based on interviewer notes were first organized by domain (each of which aligned with individual interview questions) into a matrix. The research assistant reviewed the matrix and generated an initial set of thematic codes for each domain which she then discussed in an in-person meeting with the clinical psychologist to determine the final set of codes. The clinical psychologist then independently read and coded all response summaries using the collaboratively determined codes. To obtain consistency, the two coders discussed each difference in coding and resolved through consensus.

2. Results

2.1. Participants

2.1.1. Sociodemographics

A total of 75.00% of the Veterans resided in VHA-defined rural and highly rural areas while the remaining 25.00% lived in urban areas. A total of 66.50% of the sample identified as female and 33.50% identified as male. Mean age was 45.04 (SD = 12.40, range 23–72). In terms of racial/ethnic background, 62.03% identified as White/Caucasian, 15.19% identified as Black/African American, 6.33% identified as Hispanic/Latino(a)/Mexican American, 1.27% identified as American Indian/Alaskan Native, 12.66% identified as Multiracial, and 2.53% identified as Other. A total of 51.25% reported being married/partnered, 22.50% single, 25.00% divorced, and 1.25% widowed. In terms of education, 12.50% had some high school education or a high school degree, 56.25% had completed some college, 20.00% had a four-year college degree, and 11.25% had a postgraduate degree. For employment status, 26.25% stated they were employed full time, 11.25% were employed part time, 37.50% were unemployed, and 25.00% were retired.

2.1.2. Clinical characteristics

Of the total sample, 90.00% had a probable diagnosis of PTSD at pretreatment defined as having a score equal to or greater than 33 on the PCL-5 while 88.75% had a probable diagnosis of major depression

at pretreatment defined as having a score greater than or equal to 10 on the PHQ-9. A total of 85.00% met probable criteria for both PTSD and depression.

2.1.3. Exposure to traumatic events

Table 1 presents frequency of exposure to different types of traumatic events for the total sample and by gender as well as comparisons by gender. A total of 73.75% screened positive for military sexual trauma, and 52.50% reported having been exposed to a combat zone. The total number of exposures to traumatic events including MST and combat was 8.46 (SD = 2.87) and ranged from 3 to 16 different events. Women and men did not differ in total number of events (women: mean = 8.62, SD = 2.88, men: mean = 8.15, SD = 2.88, $t(78) = -0.70$, $p = 0.49$) but did differ in frequency of type of event. Women

reported higher rates of military sexual trauma ($\chi^2(1) = 18.08$, $p < 0.0001$) and sexual assault not during military ($\chi^2(1) = 18.08$, $p < 0.0001$) while men reported higher rates of combat/exposure to war ($\chi^2(1) = 7.61$, $p = 0.006$). Rates of childhood abuse (sexual and/or physical childhood abuse) were somewhat higher in women than men but this difference was not significant (54.72% vs. 40.74%, $p = 0.24$).

2.2. Treatment outcome

Study completers ($n = 45$) did not differ from study non-completers ($n = 35$) on any demographic characteristics (all $ps > 0.05$, data not reported). Table 2 provides the means and standard deviations of all outcome measures at pre-treatment, midpoint, post-treatment and 3-month follow-up as well as the

Table 1. Frequency of exposure to different types of trauma for total sample and by gender and comparisons between genders.

| Event | Total ($N = 80$) | Females ($n = 53$) 66.25% | Males ($n = 27$) 33.75% | p -Value for male–female comparisons* |
|---|-----------------------|-----------------------------------|---------------------------------|---|
| Military Sexual Trauma (MST) | 73.75% | 88.68% | 44.44% | <0.0001 |
| Disaster | 52.50% | 54.72% | 48.15% | 0.58 |
| Fire or explosion | 57.50% | 56.60% | 59.26% | 0.82 |
| Transportation accident | 68.75% | 73.58% | 59.26% | 0.19 |
| Serious accident | 48.75% | 45.28% | 55.56% | 0.38 |
| Exposure to toxic substance | 50.00% | 45.28% | 59.26% | 0.24 |
| Physical assault | 80.00% | 84.91% | 70.37% | 0.12 |
| Assault with a weapon | 41.25% | 37.74% | 48.15% | 0.37 |
| Sexual assault not during military service | 42.50% | 50.94% | 25.93% | 0.03 |
| Combat or exposure to a war | 52.50% | 41.51% | 74.07% | 0.006 |
| Life threatening injury | 30.00% | 24.53% | 40.74% | 0.13 |
| Sudden or violent death of someone close to you | 47.50% | 45.28% | 51.85% | 0.58 |
| Sudden unexpected death of someone close to you | 81.25% | 79.25% | 85.19% | 0.52 |
| Serious injury, harm or death you caused someone else | 22.50% | 20.75% | 25.93% | 0.60 |
| Childhood sexual abuse | 32.50% | 37.74% | 22.22% | 0.16 |
| Childhood physical abuse | 41.25% | 45.28% | 33.33% | 0.30 |
| Neglect | 23.75% | 30.19% | 11.11% | 0.058 |
| Total number of traumatic events, mean (SD) | 8.46 (2.87) | 8.62 (2.88) | 8.15 (2.88) | 0.49 |

*Chi-square test for each traumatic event and independent samples t-test for total number of traumatic events.

Table 2. Observed means at each assessment and results of unconditional linear growth curve models evaluating change in each outcome measure over time.

| Outcome measure | Pre-Tx ($n = 80$) ^a | Midpoint ($n = 54$) | Post-treatment ($n = 44$) | 3-month FU ($n = 40$) | Fixed effect of time (intent to treat analyses) | | Effect size Cohen's d (95% CI) | |
|------------------------------|-------------------------------------|--------------------------|--------------------------------|----------------------------|--|------------------|-------------------------------------|---------------------|
| | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | B (SE) | Df P -value | Pre–Post | Pre- 3-month FU |
| Total PCL-5 | 52.91 (14.51) | 44.81 (16.65) | 40.05 (17.01) | 41.05 (17.82) | -4.42 (0.95) | 40.56 <0.001 | 0.89 (0.64–1.13) | 0.82 (0.57–1.06) |
| Total PHQ-9 | 16.09 (5.25) | 13.76 (5.26) | 12.11 (5.50) | 13.10 (5.75) | -1.20 (0.32) | 40.08 0.0005 | 0.76 (0.54–0.97) | 0.57 (0.31–0.83) |
| Total DERS | 116.40 (23.61) | 103.39 (21.55) | 95.45 (20.27) | 96.53 (21.15) | -7.37 (1.33) | 41.76 <0.0001 | 0.89 (0.53–1.15) | 0.84 (0.57–1.13) |
| Mean IIP-32 | 1.86 (0.44) | 1.70 (0.50) | 1.59 (0.56) | 1.57 (0.64) | -0.11 (0.03) | 42.10 0.002 | 0.61 (0.36–0.86) | 0.66 (0.39–0.93) |
| AWHODAS-2.0 | 49.31 (0.44) | 40.48 (16.16) | 39.27 (14.68) | 40.66 (19.88) | -3.25 (1.00) | 42.50 0.002 | 0.68 (0.44–0.91) | 0.58 (0.36–0.81) |
| Overall | 9.26 (3.61) | 7.17 (3.63) | 6.82 (3.50) | 7.03 (4.24) | -0.82 (0.24) | 45.46 0.0014 | 0.68 (0.42–0.93) | 0.62 (0.33–0.90) |
| Getting along with people | 10.05 (3.53) | 8.33 (3.87) | 7.57 (3.40) | 8.58 (4.20) | -0.63 (0.24) | 44.02 0.01 | 0.74 (0.52–0.96) | 0.52 (0.23–0.81) |
| Participation in society | 17.61 (8.38) | 14.17 (7.79) | 15.21 (7.33) | 14.48 (9.33) | -1.01 (0.51) | 43.17 (0.054) | 0.29 (0.06–0.51) | 0.37 (0.17–0.58) |
| Life Activities | | | | | | | | |

^a $n = 80$, with the exception of the AWHODAS-2.0 where $n = 62$ at pretreatment, 42 at midpoint, 33 at post, and 29 at 3-month follow-up.

PCL-5, Posttraumatic Stress Disorder Checklist for DSM-5; PHQ-9, Patient Health Questionnaire-9 items; DERS, Difficulties in Emotion Regulation Scale; AWHODAS-2, Abbreviated World Health Organization Disability Assessment 2.0.

results from the linear growth models. With the exception of the AWHODAS-2.0 life activities subscale, the linear effect of time was significant for all outcome variables, indicating significant improvement over time for each outcome measure. Specifically, PCL-5, PHQ-9, DERS, and IIP-32 decreased, on average, 4.42, 1.20, 7.37 and 0.11. The overall score on the AWHODAS-2.0, Getting along with People, Participation in Society and Life Activities decreased 3.25, 0.82, 0.63 and 1.01, respectively. For each outcome, the gender x time interaction and the MST x time interaction effects were not significant indicating that change over time was not moderated by gender or by MST status for any outcome.

2.3. Effect sizes

Within group effect sizes (Cohen's *d*) and their associated 95% Confidence Intervals (CI) for each outcome measure from pre-to-posttreatment and from pre-to-3-month follow-up are provided in Table 2. The effect sizes were large for PTSD and moderate for depression at both post treatment and follow-up. The effect sizes for emotion regulation (DERS) were large at both posttreatment and follow-up. The remaining effect sizes, i.e. for interpersonal problems, overall functioning, participation in society, getting along with people, and life activities were moderate to large at posttreatment and follow-up.

2.4. Treatment usage

Sixty-five percent (65%) of the 80 participants completed at least 7 of the 10 modules and 54% completed all 10 modules. The mean number of modules completed was 7.3 (SD = 4.2). Time spent on each module with the therapist averaged 32.82 (SD = 11.14) minutes. The average total duration of time spent with therapists across the entire course of treatment was 361 minutes.

2.5. Therapeutic alliance, satisfaction and feasibility

Therapeutic alliance measured at the midpoint ($n = 46$) and end of treatment ($n = 44$) was high with mean scores of 6.54 (SD = 0.55) and 6.39 (SD = 0.73), respectively.

Twenty-nine Veterans completed the posttreatment exit interview. It should be noted that Veterans interviewed do not include any who dropped out of the programme, and so we do not have information related to reasons for drop out. All those who completed the interview reported a high level of overall satisfaction. They specifically noted that participating in the programme from home was both convenient and comfortable. A 40-year-old

female mixed-race Veteran stated, 'Comfort of my own setting. It's hard for me to drive, and if I get upset in a visit makes it difficult to drive home because I would be emotional.' A 42-year-old Caucasian female Veteran commented:

Being out in a rural community like this it's been really hard to get services. The fact I was able to participate and have an iPad sent to me, it really helped. At the time, I was really isolated and having suicidal thoughts. Made me feel like someone cares and wanted to help me. WebSTAIR programme meets you where you're at.

They noted improvement in their self-awareness and understanding of emotions, as well as in their interpersonal relationships. Additionally, Veterans reported using the skills they learned in the programme to help manage daily life. A 49-year-old Caucasian female Veteran stated, 'It really helped me with my anger and figuring out how I felt with my emotions. Helped with Anxiety and PTSD. Not so jumpy. Also helped with my relations with my partner and also friends and family.' A 48-year-old Black male Veteran commented on the importance of the coach in helping him get the most benefit out of the programme, stating, 'I never knew we had that many emotions. If you can't recognize what's happening you can't do anything about it. It also had strategies. But even with all that, it wouldn't have been anything without the doctor pulling it together.'

Of the Veterans with qualitative data, nearly all (93%) experienced reporting some technical difficulty during the course of the programme (e.g. webSTAIR screen froze, video view of therapist pixilated). Nevertheless, Veterans liked connecting with their coaches over video telehealth with 76% stating it was very important to see their coach via video and 17% stating it was somewhat important. They noted that video telehealth made the programme more personal and that it enhanced the connection with their coach. Several participants commented on the importance of non-verbal communication, including a 29-year-old Black female Veteran who stated, 'I like that I could see her expression when she's trying to explain something to me. She can see my expression. She could tell I get triggered and could see my body language and follow up about what bothered me.'

Nearly 80% thought it was very important to work through the modules together with the coach. A 44-year old Caucasian female Veteran noted, 'sharing screens made it easier to navigate.' Another Veteran, a 58-year-old mixed-race woman, commented:

We were doing it together. It helped me by reading it and then going through it together. She would ask me what I thought about different things. That helped. Being able to interact with her on video it was like sitting in her office doing it with her, but I didn't have to leave home, which is one less trip to the hospital.

3. Discussion

This pilot open trial study of webSTAIR demonstrated the effectiveness and feasibility of a web-based telehealth intervention for trauma-exposed rural Veterans. Participants' ratings of satisfaction with the programme were high, and participants reported that the telehealth delivery of coaching served to increase their ability to receive mental healthcare, that the web-based skills training provided was helpful, and that the video coaching sessions were an important aspect to the programme. Symptoms of PTSD and depression, emotion regulation, interpersonal problems, as well as general and social functioning all improved in the programme, and these improvements were sustained at 3-month follow-up. Therapist alliance was high, demonstrating that rapport can be strong for a coaching model delivered over distance. There were no differences in outcomes by gender or by MST status which indicate the value of the programme for both female and male Veterans and those with and without an MST experience.

As a resource-strengthening, skills-based treatment, it was expected that webSTAIR would improve social functioning. Findings of significant reductions and medium to large effect sizes in the social functioning outcomes support this hypothesis and are consistent with results from STAIR studies (e.g. Jain et al., 2020; Weiss, Azevedo, Webb, Gimeno, & Cloitre, 2018). Recent studies of trauma-focused treatments have found that a significant mediator and moderator of PTSD outcome has been social support where social support at the beginning of treatment as well as during the course of treatment was associated with PTSD symptom reduction (Campbell, Erbes, Grubbs, & Fortney, 2020; Price et al., 2018). These observations have led to a growing interest in the contributions that positive social and interpersonal experiences can make to PTSD recovery (e.g. Reich, Nemeth, & Acierno, 2019). Given that trauma-focused treatments have been consistently identified as the most effective treatments currently available for PTSD (e.g. Forbes, Bisson, Monson, & Berliner, 2020), the integration of a trauma-focused component with webSTAIR could potentially provide greater benefits in PTSD symptom reduction relative to webSTAIR alone while webSTAIR might produce better outcomes in social functioning than a trauma-focused treatment alone.

The large to medium effect sizes obtained for PTSD and depression are equivalent to those found in other online or distance programmes (Lewis et al., 2019; Olthius et al., 2016) and importantly were maintained at 3-month follow-up. The underlying mechanisms which create the reductions in PTSD and depression observed in skills-focused interventions are unknown.

Several of the skills taught in STAIR involve engaging in an activity (e.g. taking a walk or engaging in a pleasurable activities) and may create behavioural activation, which is an established technique for reducing depression (e.g. Martell, Dimidjian, & Herman-Dunn, 2013) and is known to reduce both depression and PTSD in veterans (Jakupcak, Wagner, Paulson, Varra, & McFall, 2010). The treatment also encourages mastery in simple day-to-day activities and self-reflection on positive aspects of these achievements (e.g. positive self-statements) may contribute to changes in cognitions that drive or maintain PTSD symptoms. Lastly, the focus on interpersonal skills and social engagement is expected to lead to more frequent and more positive interactions with others. Positive interactions with others may provide 'corrective emotional experiences' that change beliefs about oneself and create or reinforce more positive attitudes about self and others, which then may contribute to PTSD symptom reduction.

Since webSTAIR is administered entirely at a distance and provides Veterans with access to resources and skills-training through a self-guided online platform, this approach has the potential to reach isolated populations. One motivation for implementing this intervention among rural Veterans was the concern that rural populations are at risk for experiencing social isolation. We did not measure social isolation as it is formally defined (e.g. objective measures of size and participation in social networks). However, the AWHODAS-2 Participation in Society subscale indicated changes in the participants subjective assessment of being more engaged in community activities and feeling more accepted by others in the community. These perceived changes are a marker of social functioning, but may also contribute to reducing risk for social isolation.

The study emphasized enrolment of rural women Veterans who had experienced MST. Through outreach efforts to MST coordinators, the study enrolled much higher rates of Veterans with MST than in the general population among not only female but also male Veterans. National VA screening data indicate that 24% of female Veterans and 2% of male Veterans report MST (Wilson, 2018) while in this study, 89% of female and 44% of male Veterans reported MST. The outcomes of the treatment did not change by virtue of gender or MST status indicating the potential benefits of the treatment across genders and among those who have experienced MST. Moreover, the large response among male Veterans who have experienced MST suggests there may be an unmet need among male Veterans in having services or treatment that openly invite recognition of this experience.

The average amount of time Veterans spent engaged with a therapist was approximately 33 minutes per session which suggests that there may be potential

personnel-related cost savings in delivering a web-based intervention. Approximately 65% of Veterans completing up to the 7th module and 54% completed all 10 modules. Because the project was an evaluation programme, not a research study, there were no special efforts made to retain participants in the project (e.g. ensure before enrolment that there were no plans for long travel or hospitalization that might disrupt completion) as would occur in a research study. The observed attrition rates reflect naturalistic usage and are satisfactory compared to other naturalistic studies where retention rates appear to fall to 20% by the fifth session (Eysenbach, 2005).

There are several limitations to the current study. The results of the study are based on an open trial and there was no control condition. Moreover, early adopters of a programme may be more enthusiastic and willing, which can impact the generalizability of the findings. Thus, a randomized controlled trial is necessary to test the relative effectiveness and generalizability of the results. The assessment of PTSD and depression were based on self-report and a structured clinical assessment would have provided more reliable diagnoses. Nearly all participants reported experiencing some difficulties with technology which were likely due to the bandwidth demands of simultaneous video presentation of the web programme and therapist on the same screen. Nevertheless, the participants found the presence of the therapist alongside the web programme an important component of their treatment.

Future studies will benefit from investigating whether alternatives such as asynchronous presentation of therapist (not during web engagement) will be equally effective. This format also allows systematic experimentation with the frequency of therapist contact. Lewis et al. (2017), for example, tested an online PTSD programme in which the participants received brief coach/therapy sessions every other week which provided significant PTSD symptom reduction. Evaluation of the impact of the frequency of therapist sessions (e.g. weekly versus biweekly) will help identify the amount of therapist contact for optimal patient outcome. The amount of therapist contact required for good outcome may be contingent on patient baseline characteristics (e.g. high versus low comorbidities) as well as treatment experience (e.g. rate of between-session improvement). These types of moderator and mediator analyses can support the development of more personalized, patient-centred web programming to enhance retention and improve outcomes.

Overall, this study reports on an innovative integrated telehealth web-based programme with good outcomes and high satisfaction among hard-to-reach and hard-to-engage patients that have experienced high levels of trauma exposure. While the study targeted rural populations, particularly women Veterans

who had experienced MST, the actual cohort was more mixed, with a substantial minority of urban dwellers, male Veterans, and individuals who did not experience MST. This enrolment approach was consistent with our commitment to provide distance care to those who would have otherwise struggled to access face-to-face care for a variety of reasons and indicates the potential generalizability of the findings. The findings contribute to a body of research suggesting that there can be both high satisfaction and effectiveness when delivering mental healthcare over distance. Indeed, a number of studies have indicated that cognitive-behavioural treatments for PTSD are as effective over telehealth delivery as they are in person (e.g. Acierno et al., 2017; Morland et al., 2010; Rosen, Chard, Resick, & Frueh, 2014). These results are particularly relevant after world events such as the COVID-19 novel coronavirus pandemic have made clear the importance of developing and advocating for effective distance interventions, so that continuity of care is not disrupted during times of global unrest and environmental crises (McFarlane, Jetly, Castro, Greenberg, & Vermetten, 2020). Moreover, providing programmes that highlight the importance and benefits of social engagement, even at a distance, is important during a time when there is greater risk of social isolation for many in the general population. Research assessing the integration of social support strategies and effective use or enhancement of social skills as part of distance intervention may be of particular value.

Data availability statement

Under the U.S. Department of Veterans Affairs security and confidentiality guidelines, Veterans' data cannot be shared or made freely available to the general public.

Disclosure statement

No potential conflict of interest was reported by the authors.

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