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BRIEF REPORT

Examining treatment outcomes for military service members in an intensive treatment program for posttraumatic stress disorder

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ABSTRACT

To date, few studies have evaluated treatment outcomes for military service members who complete massed treatments for posttraumatic stress disorder (PTSD). Furthermore, no studies have directly compared treatment outcomes between service members and veterans in a massed treatment setting. In the present study, we evaluated treatment outcomes for military service members who completed an intensive treatment program (ITP) for PTSD and compared their outcomes to military veterans who completed the same program. Data were collected from 558 participants who identified as U. S. military service members ($n = 68$) or veterans ($n = 490$) during a two-week, cognitive processing therapy-based ITP. Results showed that service members and veterans experienced large reductions in PTSD ($d = 1.26$ & $d = 1.35$, respectively) and depression ($d = .82$ & $d = 1.01$, respectively) severity after treatment. In addition, the reductions in PTSD and depression severity for service members were equivalent to those of veterans using a Bayes factor equivalence approach. This study contributes to the limited literature on treatment outcomes for service members who complete massed treatments for PTSD. This research is particularly important as lawmakers and military leaders continue to remove barriers to treatment for service members suffering with PTSD.

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Military service members; veterans; posttraumatic stress disorder; massed treatment; empirically based psychotherapy

What is the public significance of this article?— This study found that military service members and veterans experienced equivalently large reductions in PTSD and depression severity after completing a two-week intensive treatment program for PTSD. These findings contribute to the limited literature investigating treatment outcomes for service members who complete massed treatments for PTSD.

Traumatic exposure is a well-known risk of military service. Combat deployments and military sexual traumas (MST) have been associated with increased risk of developing posttraumatic stress disorder (PTSD) as well as other mental health conditions, such as major depressive disorder and substance use disorder (Campbell et al., 2021; Magruder & Yeager, 2009; Nichter et al., 2022; Teeters et al., 2017). Other common traumatic exposures for military service members include training accidents, medical emergencies, natural disasters, and witnessing the death of others (Straud et al., 2019).

In the U.S. military, new incidence of PTSD rapidly increased after the start of combat operations in Afghanistan in 2001 and the Department of Defense's systematic overhaul of its policies governing the reporting procedures and supportive programming for victims of MST in 2004 (Judkins et al., 2020; McCabe et al., 2020). Recent reports suggest that annual incidence rates of PTSD for U.S. military service members are 10 to 12 cases per 1,000 people per year or about 8% of all mental health diagnoses per year (Armed Forces Health Surveillance Division [AFHSD], 2021; Judkins et al., 2020). Furthermore, elevated PTSD symptoms remain quite common for U.S. service members, estimated to be around 10% and 9% in the active and reserve components respectively (Engel et al., 2021; Meadows et al., 2021).

Over the last decade, U.S. lawmakers and military leaders have attempted to remove barriers to mental health care for service members through a variety of policy efforts. For example, the Brandon Act amended title 10 of the U.S. Code to protect access to and confidentiality of service members seeking mental health services (Brandon Act, 2021). Despite these efforts, service members often do not seek treatment for PTSD in

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the military health system, largely due to concerns about confidentiality, career impact, and stigma (Fikretoglu et al., 2022). This phenomenon is troubling particularly given that service members may be closer to the point of psychological injury and that persistent, untreated PTSD symptoms are associated with negative health, economic, and social outcomes (Benedict et al., 2020; Ramchand et al., 2015). Furthermore, limited treatment seeking creates a challenge for researchers interested in determining whether service members respond to evidence-based psychotherapies (EBPs) for PTSD like other, similar populations, such as military veterans or retirees.

As a result, much of the existing PTSD treatment research involves civilian and veteran samples. When included in studies, service members are often combined with veterans into a mixed sample rather than analyzed separately. In studies with mixed samples, service members and veterans tend to show clinically meaningful reductions in PTSD and depression severity after completing trauma-focused EBPs, such as cognitive processing therapy (CPT) and prolonged exposure (PE; Ronconi et al. 2015; Steenkamp et al. 2015). Yet, as a combined group, they are more likely to experience dampened responses to EBPs and to drop out of treatment relative to civilians (Dillon et al., 2019; Jacoby et al., 2022; Varker et al., 2021). Less robust effects and higher dropout have been attributed to several factors including complicating features of the traumatic event (e.g., traumatic loss or institutional betrayal), aspects of military culture (e.g., warrior ethos or stigma), and practical issues (e.g., military training or confidentiality concerns; Dillon et al., 2017).

Research comparing treatment outcomes suggests that there may be slight, if any, differences between service members and veterans. For exposure therapies, a meta-analysis of 19 randomized controlled trials (RCTs) found that reductions in PTSD severity were not significantly different between service members and veterans (overall Hedge's $g = .44$) when compared to control groups (McLean et al., 2022). For CPT, a meta-analysis of nine RCTs reported significant, albeit slight, differences in treatment outcomes with veterans endorsing slightly more symptom reduction compared to control conditions than service members (Hedge's $g = -.51$ vs. $-.45$, respectively; Raines et al., 2024). However, these results should be interpreted with caution because of the low number of studies included in its analyses, as noted by the study's authors. When taken together, these meta-analytic findings suggest that service members may experience slightly less robust effects of CPT but not exposure therapies when compared to veterans. To date, no study has directly compared treatment outcomes between service members and veterans within the same study.

Research on dropout rates suggests that they are similar for service members and veterans (Edwards-Stewart et al., 2021). Nevertheless, higher dropout rates may impact research on service members more than veterans because they are less likely to engage in treatment and research overall. Furthermore, studies involving samples of only service members are less common, and they tend to involve smaller sample sizes than combined or veteran only studies (for examples, see McLean et al., 2022; Raines et al., 2024). Therefore, it may be beneficial to investigate treatment differences between service members and veterans in a format that reduces the risk of dropout.

One way to decrease the risk of dropout has been to offer EBPs in a massed format. Massed treatment refers to the consolidation of treatment into shorter timeframes than the common, weekly session format (e.g., 10 sessions in one or two weeks rather than 10 weeks). Several EBPs have been evaluated in massed formats as either stand-alone individual EBPs or as EBPs embedded within intensive treatment programs (ITPs; Wright et al., 2023). Results from a meta-analysis of 11 studies showed that massed EBPs delivered in stand-alone and ITP formats generated low dropout rates (pooled dropout rate = 5.51%) and large reductions in PTSD severity (mean Cohen's $d = -1.57$; Sciarrino et al., 2020). These results also include five studies involving combined samples of service members and veterans receiving either CPT or PE, suggesting these findings may apply to service members. Since the publication of this meta-analysis, additional research has bolstered empirical support for the use of massed EBPs in treating service members and/or veterans (for example, Dell et al., 2023; Goetter et al., 2021; Held et al., 2023, 2024; Peterson et al., 2023). However, few studies have evaluated treatment outcomes for service members alone (Foa et al., 2018; Morris et al., 2023) and no study has compared outcomes between service members and veterans during massed treatment for PTSD.

The objective of the present study was to evaluate treatment outcomes for U.S. military service members who completed a CPT-based ITP for PTSD. Based on previous research of massed treatment, we hypothesized that service members would endorse large reductions in PTSD and depression severity after completing the ITP. In addition, we hypothesized that service members would endorse similar reductions in PTSD and depression severity when compared to veterans who completed the same program. Together, addressing these

hypotheses will clarify whether massed treatments for PTSD have similar effectiveness for military service members as veterans, a more well-studied group. By clarifying effectiveness, clinicians treating service members may be more likely to consider referrals for massed treatment thereby facilitating access to EBPs for PTSD.

Method

Participants

Data were collected from 558 U.S. military service members and veterans who participated in a 2-week ITP at the Road Home Program at Rush University Medical Center in Chicago, Illinois between June 2020 through October 2024. Participants were grouped into alternating combat or MST cohorts of up to 16 mixed-gender participants. Most participants were veterans ($n = 490$; 80%). Of the currently serving participants ($n = 68$), 72% were active-duty service members ($n = 49$), and 28% served in the Reserve or National Guard ($n = 19$). Overall, participants were 45.64 years old ($SD = 10.67$, range = 21–84 years), identified as non-Hispanic (83%), White (61%), and male (54%). Of the assessed demographic variables, significant group differences were observed between service members and veterans for age ($t[96.76] = 7.89$, $p < .001$), service era ($\chi^2[1] = 13.99$, $p < .001$), and rank ($\chi^2[6] = 46.51$, $p < .001$). Service members were on average 9.03 years younger than veteran participants ($M = 37.71$ [$SD = 8.61$] & $M = 46.74$ [$SD = 10.47$], respectively). All the service member participants served after September 11, 2001, while 80% of the veteran participants served after September 11, 2001. Lastly, service members tended to be more senior ranking than the veterans in this study i.e., a higher proportion of senior

Table 1. Demographic and clinical characteristics of sample ($N = 558$).

	Service members (n = 68)		*Veterans (n = 490)*	
Characteristic	*n*	*%*	*n*	*%*
Sex				
Male	41	60%	260	53%
Female	27	40%	230	47%
Ethnicity				
Not Hispanic	53	78%	408	83%
Race				
Native American/Alaskan Native	0	0%	6	1%
Asian	1	2%	17	4%
Black or African American	7	10%	122	25%
Native Hawaiian or Pacific Islander	1	1%	5	1%
White	52	76%	290	59%
Other	7	10%	49	10%
Marital status				
Married	43	62%	253	52%
Single	15	23%	114	23%
Divorced	7	10%	93	19%
Separated	2	4%	19	4%
Widowed	1	1%	7	1%
Other	0	0%	4	1%
Military service branch				
Air Force	10	15%	67	14%
Army	45	66%	264	53%
Coast Guard	1	1%	1	1%
Marine Corps	4	6%	73	15%
Navy	8	12%	85	17%
Service era				
After September 11, 2001	68	100%	382	80%
Highest rank in service *				
E-1 to E-4	8	12%	209	43%
E-5 to E-6	22	32%	177	36%
E-7 to E-9	21	30%	56	11%
O-1 to O-3	7	10%	21	4%
O-4 to O-6	9	13%	19	4%
WO-1 to WO-5	1	1%	5	1%
Not Reported	0	0%	3	1%
	M	*SD*	*M*	*SD*
Age	37.71	8.61	46.74	10.47
Baseline PCL-5 ^	54.66	12.47	55.00	13.53
Baseline PHQ-9 ^	17.50	5.84	16.67	5.50

Note. *E refers to enlisted rank, O refers to officer rank, and WO refers to warrant officer rank; PCL-5 = Posttraumatic Stress Disorder Checklist for DSM-5; PHQ-9 = Patient Health Questionnaire; ^ no significant differences were observed between service members and veterans for baseline PCL-5 ($t[90.33] = .21$, $p = .84$)and baseline PHQ-9 ($t[84.38] = -1.11$, $p = .27$).

noncommissioned officers (30% vs. 11%) and officers (23% vs 8%). Further demographic and clinical information is shown in Table 1.

Procedure

The study procedures were approved by the Institutional Review Board at Rush University Medical Center with a waiver of consent, because these data were collected as part of routine clinical care. Participants completed an intake assessment, which included a semi-structured biopsychosocial interview, administration of self-report measures, and the Clinician-Administered PTSD Scale for DSM–5 (CAPS-5; Weathers et al., 2018) to assess for PTSD. Participants were accepted into the program if they were diagnosed with PTSD. Exclusionary criteria included: psychiatric hospitalization within 30 days; suicide or homicide attempt within 30 days; untreated and/or active symptoms of mania or psychosis; untreated and/or active substance use disorders; inability to independently complete activities of daily living; or unstable housing.

The ITP was centered on CPT and participants received twice daily individual CPT sessions for a total of 16 individual sessions. Additionally, participants engaged in 17 hours of group therapy focused on Dialectical Behavioral Therapy (DBT) skills, CPT skills, art therapy, and mindfulness. Finally, participants had the opportunity to engage in up to six acupuncture sessions and individual consultations for traumatic brain injury, pelvic floor health, chronic pain, psychiatric medications, DBT skills, substance use, and spirituality concerns. For more information about this ITP, see Held et al. (2023).

From intake to treatment completion, service members and veterans experienced the same assessment and treatment procedures. Thus, there were no modifications made to this program for service members. Service members were required to secure leave to attend programming. All communication with commands or military medical providers was initiated and authorized by the service member through releases of information.

Measures

Demographic characteristics

During intake procedures, participants reported demographic characteristics including age, sex, race, and ethnicity, and their reported military background, including service era, branch, rank, and deployment history.

The Posttraumatic Stress Disorder (PTSD) checklist for DSM-5 (PCL-5; Weathers et al., 2013)

The PCL-5 is a 20-item self-report measure that assesses PTSD symptoms that correspond with the DSM-5 PTSD criteria within the last month. Items are rated on a 5-point Likert scale ranging from 0 (*not at all*) to 4 (*extremely*). Scores range from 0 to 80 with higher scores indicating greater PTSD severity. The PCL-5 has demonstrated strong reliability and validity (Belvins, et al., 2015) and is sensitive to detecting clinical change with service members (Wortmann et al., 2016). For this study, the PCL-5 was collected prior to any treatment (baseline) and at post-treatment. This measure demonstrated excellent reliability for baseline and post-treatment assessments (Cronbach's α = .91 and .96, respectively). During the ITP, the PCL-5 was modified to assess symptoms within the last week.

The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001)

The PHQ-9 is a 9-item self-report measure that assesses the frequency of depressive symptoms in the past two weeks. Items are rated on a 4-point Likert scale ranging from 0 (*not at all*) to 3 (*nearly every day*). The range of the measure is 0–27 with higher scores indicating greater severity. The PHQ-9 has been found to be reliable and valid, demonstrating sensitivity to change over time (Löwe et al., 2004). In this study, the PHQ-9 was collected at the same time points as the PCL-5. This questionnaire demonstrated good reliability at baseline and post-treatment assessments (Cronbach's α = .84 and .88, respectively).

Data analytic plan

In addition to descriptives across the two programs, we used Gibbons' variant of Cohen's *d* for repeated measures was used to estimate a standardized effect size for change in depression and PTSD severity over time (Gibbons et al., 1993). We employed a Bayes factor approach to test the equivalence of outcomes for service members versus veteran groups (van Ravenzwaaij et al., 2019). Null hypothesis significance testing (NHST) cannot establish equivalence, as it is designed to determine whether enough evidence exists that a null hypothesis of no group differences can probabilistically be rejected. Conversely, non-inferiority or equivalence tests can establish the likelihood of the groups being considered equivalent within a specified margin. The Bayes factor approach to equivalence testing quantifies the probability of the hypothesis that the groups are equivalent relative to the hypothesis that one group is superior to the other based on the utilized data. Unlike other

approaches to non-inferiority and equivalence testing, the Bayes factor approach avoids a common conundrum in which differences between groups could be considered significantly different with NHST tests while also being considered non-inferior or equivalent within a designated margin using non-inferiority or equivalence testing. Additionally, this approach yields easily interpretable Bayes factors, which reflect probabilities of equivalence compared to superiority of one group. For instance, a Bayes factor of 5 would indicate that the hypothesis of the groups being equivalent in the outcome is 5 times more likely than a hypothesis that group being superior, given the data provided.

We tested the equivalence of overall PCL-5 and PHQ-9 scores at endpoint. We chose relatively conservative 5-point PCL-5 and 3-point PHQ-9 equivalence margins, which have been used in similar studies involving these measures (e.g., Held et al., 2023, 2024). Equivalence, rather than non-inferiority was tested due to the desired two-sided nature of the comparisons.

A sensitivity analysis also examined equivalence of the active-duty service members ($n = 49$) as compared to veterans ($n = 490$) after removing part-time service members (Reserve or National Guard; $n = 19$) from the sample. Analyses were conducted in R version 4.4.2.

Results

Treatment dropout rates were similar for service members (3.6%) and veterans (3.4%). During this 2-week ITP, service members endorsed large reductions in PCL-5 ($M_{change} = 20.67$; $SD_{change} = 16.32$; $d = 1.26$, 95% *CI* [.94, 1.59]) and PHQ-9 ($M_{change} = 4.94$; $SD_{change} = 5.90$; $d = .82$, 95% *CI* [.91, 1.10]) total scores. Results were similar when the Reserve and National Guard service members were removed from the analyses, large reductions in PCL-5 ($M_{change} = 23.32$; $SD_{change} = 15.12$; $d = 1.45$, 95% *CI* [1.06, 1.84]) and PHQ-9 ($M_{change} = 5.79$; $SD_{change} = 5.55$; $d = .96$, 95% *CI* [.64, 1.28]) total scores. For veterans, large reductions in PCL-5 ($M_{change} = 21.94$; $SD_{change} = 16.63$; $d = 1.35$, 95% *CI* [1.22, 1.48]) and PHQ-9 ($M_{change} = 5.75$; $SD_{change} = 5.35$; $d = 1.01$, 95% *CI* [.91, 1.12]) total scores were observed.

Results of the Bayes factor equivalence analysis indicated that endpoint PTSD severity for service members and veterans were 69.63 times more likely to be equivalent than either group being superior to the other. In addition, results indicated that endpoint depression severity across the two groups was 63.31 times more likely to reflect equivalence than either group being superior to the other.

The sensitivity analysis involving active component service members only indicated that endpoint PTSD severity for service members and veterans were 21.74 times more likely to be equivalent than either group being superior to the other. When examining depression for this reduced sample, results indicated that the hypothesis that these two groups experienced equivalent endpoint depressive symptoms after treatment was 879.19 times more likely than either group being superior to the other.

Discussion

The present study investigated treatment outcomes for U.S. military service members who completed a CPT-based ITP for PTSD. First, we hypothesized that service members would experience similarly large reductions in both PTSD and depression severity after treatment. Supporting our hypothesis, we found that service members endorsed large reductions in PTSD ($d = 1.26$) and depressive ($d = .82$) severity after treatment. These findings are consistent with previous research of treatment effectiveness involving veteran only samples or mixed samples of service members and veterans in randomized clinical trials of EBPs (Steenkamp et al., 2015). Furthermore, these observed effects are consistent with those observed in studies of massed EBPs for PTSD (Sciarrino et al., 2020). Consistent with previous research, the dropout rate was low for service members and veterans (3.6 and 3.4%, respectively) and comparable to those reported in previous studies of massed treatments involving civilian and military samples (Sciarrino et al., 2020). Second, we proposed that service members would experience similar reductions in PTSD and depression severity as veterans who also completed this ITP. Our findings supported this hypothesis with results showing that service members had equivalent PTSD and depression severity as veterans after treatment. Our findings are consistent with previous research comparing treatment outcomes for service members and veterans who completed EBPs, which generally show similar outcomes (McLean et al., 2022; Raines et al., 2024).

This study contributes to the limited literature evaluating PTSD treatment outcomes for service members. Our findings suggest that ITPs may be particularly well-suited to address the unique barriers to care faced by many service members. The low dropout rate observed in this study indicate that this ITP may have mitigated many of the barriers that often hinder treatment engagement, such as logistical barriers or busy operational (training or deployment) schedules. Thus, our findings suggest that massed treatment is not only clinically effective for service members but that it can also be

compatible with the operational demands of military service, which includes training and deployment schedules that limit service members' availability for weekly treatment. By creating more compatible treatment options, service members may be more likely to seek out care while in service thereby reducing the risk that untreated PTSD symptoms will hinder career progression, impact health, or impair relationships.

Despite its strengths, several limitations must be considered when interpreting the results of the present study. First, data were collected from a real-world clinical setting and not as part of an RCT. Therefore, we cannot definitively conclude that the changes observed in this study were directly attributable to the treatment itself. It is possible that other factors may explain the observed reduction in PTSD and depression severity. Future studies should compare clinical outcomes for service members during massed treatments for PTSD in the context of an RCT, ideally with an active control condition. Second, the ITP in this study included several auxiliary treatment modalities (e.g., skill-based groups and specialty consultations), limiting our ability to isolate the unique treatment effects of CPT on clinical outcomes and to generalize our findings. In the future, researchers should consider evaluating treatment outcomes for service members using massed, stand-alone EBPs (e.g., Held et al., 2022; Peterson et al., 2023), which do not include any auxiliary treatments. Third, our sample included a mixture of service members in the active and reserve (Reserve and National Guard), but there were too few service members in the reserve component to statistically compare treatment outcomes between the different components. However, when the reserve component was removed from analyses, the results suggest that there may be differences in treatment outcomes between the active and reserve components (e.g., larger effect sizes for active component only and markedly different Bayes factors between the primary combined and sensitivity analyses). Differences in outcomes might be attributed to the markedly different pre- and post-deployment experiences for reserve component service members compared to their active counterparts, which often include less preparation and/or support pre-deployment, civilian job concerns, and reintegration difficulties post-deployment (Griffith, 2011). Future studies should investigate treatment outcomes for Reserve and National Guard service members to empirically test whether EBPs have equivalent treatment efficacy and low dropout in this rarely studied subset of service members. Reserve and National Guard service members are even less likely than active-duty service members to initiate PTSD treatment thereby limiting our understanding of how this group responds to EBPs for PTSD (Goldberg et al., 2022). Fourth, clinical outcomes were assessed using self-report measures to evaluate changes in PTSD and depression severity. While the PCL-5 and PHQ-9 have demonstrated sensitivity to change, self-report data has greater possibility of bias in symptom report. Future research may consider conducting a structured interview (e.g., the CAPS-5), at both baseline and post-treatment. Fifth, this study included participants willing and able to travel for treatment, which may have disproportionately limited participation by more junior service members. Given that the service members in this study were more senior ranking relative to the veterans, it is possible that our findings may not generalize to the broader service member population. Subsequent investigations should include a more balanced distribution of ranks among participants or include an assessment of military-related facilitators of and barriers to care for service members. Massed treatments offered virtually may offer a helpful bridge for junior service members to access care. This format has demonstrated efficacy and holds promise as a novel pathway to evidence-based treatments for PTSD (Murphy, 2024).

Despite these limitations, this study addressed a critical gap in the literature investigating treatment outcomes for service members who complete massed treatments for PTSD. The existing literature has demonstrated that service members (typically studied in mixed samples with veterans) endorse large reductions in PTSD and depression severity. However, the present study is the first to compare treatment outcomes between service members and veterans in the context of massed treatment. The present study demonstrated that service members experience equivalent large reductions in PTSD and depression severity as veterans after completing an ITP for PTSD. These findings bolster the ever-widening evidence base supporting the clinical efficacy of massed treatments for PTSD for those exposed to military-related traumatic exposures. For service members, massed treatments for PTSD like the one in this study may help remove barriers to care, including limited access to EBPs or limited time due to busy operational schedules. By accelerating the pace of treatment, service members may find that EBPs can quickly reduce symptoms and thereby efficiently improve their functioning at work and at home.

Lawmakers and military leaders should consider policy initiatives that expand access to massed treatments for PTSD for military service members. Greater access to effective treatments may reduce the burden of untreated PTSD on service member's health, relationships, and occupational functioning thereby improving overall operational readiness.

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Authors' contributions

Jonathan W. Murphy was responsible for conceptualization, methodology, formal analyses, project administration, and writing (original draft) of the manuscript.

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Joseph Zolper was responsible for writing (original draft, reviewing, and editing) of the manuscript.

Sarah Pridgen was responsible for data curation, conceptualization, and writing (reviewing and editing) of the manuscript.

Blake Schroedter was responsible for writing (original draft, reviewing, and editing) of the manuscript.

Philip Held was responsible for the conceptualization, funding acquisition, investigation, supervision, and writing (reviewing and editing) of the manuscript.

The author(s) read and approved the final manuscript.

Data availability statement

The data that support the findings of this study are available from the corresponding author (JM) upon reasonable request.

Ethics approval and consent to participate

The study procedures were approved by the Institutional Review Board at Rush University Medical Center. A waiver of informed consent was obtained from the Rush University Medical Center IRB as all assessments were collected as a part of routine care. All research procedures followed the American Psychological Association's Ethical Principles of Psychologists and Code of Conduct and were performed in accordance with the Declaration of Helsinki.

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