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14. ABSTRACT This is a randomized controlled trial study that implemented prolonged exposure therapy (PE) to military Veterans. We recruited 175 Veterans to participate in the study. Our goal was to compare PE conducted in three different ways: (1) PE that is office-based telehealth (OBT; Veterans come to the clinic to meet with the therapist using videoconferencing technology), (2) PE delivered via home -based telehealth (HBT; Veterans stay at home and meet with the therapist using the computer and video cameras), and (3) PE delivered in home, in person (IHIP; the therapist comes to the Veterans' homes for treatment). We hypothesized that the IHIP approach, compared to the other two approaches, will be more effective at reducing the PTSD symptoms along with depression and anxiety symptoms and result in higher completion rates because therapists provide therapy in a naturalistic context. We have been referred 899 Veterans. Of the 899 referred, including 735 males (82%) and 164 females (18%), with 180 Veterans participating in the study. 175 Veterans (97% of those enrolled) were randomized while 5 (3%) were pilot subjects. Of the 175 randomized participants, 109 (62%) have completed therapy and 66 (38%) have dropped out of therapy. When the data was analyzed, we found that there was no difference in reductions of PTSD and anxiety symptoms following PE by treatment modality across any time point; however, OBT had significantly smaller reductions in BDI-II scores at posttreatment and 6-month follow-up than IHIP (mean diff. 7.3 at posttreatment and 8.0 at 6-month follow up; $p = .049$, $p = .023$, respectively). For treatment completion, veterans in the HBT (odds ratio [OR] = 2.67; 95% confidence interval [CI] = 1.10, 6.52; $p = .031$) and OBT (OR = 5.08; 95% CI = 2.10; 12.26; $p < .001$) conditions were significantly more likely than veterans in IHIP to drop out of treatment. In conclusion, this study found that providers can effectively deliver PE through telehealth and in-home, in-person delivery, but the rate of treatment completion was higher in IHIP care.					
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INTRODUCTION:

Posttraumatic stress disorder (PTSD) is a chronic condition associated with significant impairments in mental and physical. Although there has been a significant improvement in the availability of psychological interventions for PTSD, rates remain high among veterans (7-20%; Dohrenwend et al., 2006; Richardson et al., 2010; Seal et al., 2009; Smith et al., 2016), while evidence-based treatment initiation and completion remain low (Kehle-Forbes, Meis, Spont, & Polusny, 2016; Maguen et al., 2019). Improving veteran access to high-quality care and enhancing interest in receiving that care remains a high priority within the Veteran's Health Administration (VHA). This study examined the provision of an evidence-based treatment for PTSD, Prolonged Exposure Therapy (PE), between three treatment modalities on clinical and process outcomes.

We successfully recruited **175** Veterans (our target sample size) to participate in the study. We aimed to compare PE conducted in three different ways: (1) PE that is office-based telehealth (OBT; Veterans come to the clinic to meet with the therapist over telehealth), (2) PE delivered via home-based telehealth (HBT; Veterans stay at home and meet with the therapist using the computer and video cameras), and (3) PE delivered in home, in person (IHIP; the therapist comes to the Veterans' homes for treatment). We examined if symptoms of PTSD and comorbid conditions such as depression, and anxiety get better (less severe) after the treatment and six months later. We also examined if there are differences in the three modalities of providing the PE therapy. We hypothesized that the IHIP approach, compared to the other two approaches, will be more effective at reducing the clinical symptoms experienced by these Veterans because it will help Veterans attend each session and adhere to the therapy protocol better including doing homework assigned by the therapists (such as doing feared activities around the house or the neighborhood). However, the delivery of IHIP may cost more than the delivery of PE via the other modalities. Additionally, we hypothesized that the IHIP approach will show a better treatment completion rate due to higher accountability and provider control for session attendance. The findings of this study will benefit military Veterans and Active Duty military personnel by investigating new ways for treating PTSD so that the most effective treatments can be made widely available. We also aimed to explore the best ways to manage urgent situations, such as a physical or emotional crisis, that occur when providing treatment in homes and through home-based video technology.

BODY:

Our focus in the final project year (30 Sep 2018 - 29 Sept 2019) was to accomplish the tasks outlined in the Statement of Work (SOW). With recruitment, treatment, and all follow-up assessments completed, study resources were mostly focused on data management and data analysis. The study database is complete, data entry is complete, as is quality control procedures overseen by the local project data manager. In addition, data cleaning was completed by detecting and correcting inconsistencies within the database to prepare the data to be used for main analysis and future secondary analyses. Analysis and other higher-level statistical tests and procedures were performed by an off-site statistician, Dr. Mackintosh.

We continued to meet monthly with the parallel study examining home-based CPT led by Drs. Resick and Peterson in order to create a collapsed database by comparing and merging overlapping clinical outcome variables from the two studies. In tandem with the parallel study, we have completed examining and matching overlapping variables, creating a new codebook for the collapsed database, and setting up each of the study's data in appropriate format for collapsing. PI's of both studies are actively in discussion of future projects and possible yield

from this collapsed data which will allow us to achieve analysis approaches that were impossible with the current sample size. Data Use Agreement was approved and data managers from both sites have set up plans to create the collapsed database.

At the date of publication for our previous annual report in October of 2018 we had been referred 899 Veterans. This number has not changed since this report as recruitment efforts have finished. The 899 referred to the study include 735 men (82%) and 164 women (18%). Of the 899 referred, 180 Veterans (20%) were enrolled in the study. Five Veterans (3% of those enrolled) were enrolled in the pilot study and were not randomized. Of the five Veterans in the pilot study, three have completed the study (therapy through the 6-month follow-up), and two have completed treatment through the 4-month assessment. Neither of those two, however, responded to staff requests to complete the 6-month assessment. Of the 180 enrolled, 175 Veterans (97% of those enrolled) are enrolled in the full study. These pilot sessions helped us refine our procedures for recruitment, telephone screening, consent, assessment, the VTC modality, and treatment.

We presented some anecdotes from this study at ISTSS, ABCT and the Combat PTSD Conferences (see full reportable outcomes below). Of the five enrolled in the pilot study, 4 (80%) are male, and 1 (20%) is female. All five (100%) pilot subjects identify as Caucasian. Of the 175 additional Veterans enrolled in the larger study, 132 (75%) are male and 43 (25%) are female. The ethnic information for the 175 randomized Veterans is as follows: 48 (27%) identify as Hispanic or Latino, 115 (66%) Not Hispanic or Latino, and 12 (7%) declined to answer. The racial information is as follows: 71 (41%) identify as Caucasian, 50 (29%) African American, 14 (8%) Asian, 4 (2%) Native Hawaiian or Pacific Islander, 5 (3%) American Indian or Alaskan Native, 17 (10%) Other, and 14 (8%) declined to answer.

Of the 899 referred, 719 (80% of the total referred) were not enrolled. Of those not enrolled, 113 Veterans (16%) were not enrolled into the study because they were unreachable by phone (no response after 6 voice messages); 251 (35%) were ineligible for study inclusion after completing the phone screen; 265 Veterans (37%) were not interested in joining the study; 41 Veterans (6%) were eligible after the phone screen, but contact was lost before baseline assessment could be scheduled; 24 (3%) were initially eligible at phone screen, but found ineligible for study eligibility criteria through the baseline assessment; one individual expressed no longer being interested in participating in the study at the baseline assessment after being found eligible in the phone screen; 25 (3%) individuals were on hold or in the process of being contacted when the study met its target sample, and efforts were made to refer these Veterans to a different service.

The randomization breakdown for the 175 Veterans enrolled into PE treatment is as follows: 58 (33%) were randomized to receive In-Home, In- Person (IHIP); 59 (34%) were randomized to receive Office Based Telehealth (OBT); and 58 (33%) were randomized to receive Home Based Telehealth (HBT).

Of the 175 randomized participants, 109 (62%) have completed therapy, and 66 (38%) have dropped out of therapy. The 66 who dropped out included 16 (24%) who reported that they did

not like the therapy, 16 (24%) who stopped attending their therapy sessions for unknown reasons and did not respond to phone calls and letters from study personnel, 6 (9%) whose primary health concern was not PTSD, 10 (15%) who had scheduling difficulties arise and were no longer able to attend therapy sessions, 5 (8%) who moved outside of radius during treatment, 2 (3%) who were randomized but became unreachable before beginning therapy, and 11 (17%) who cited other reasons.

Of the 175 who were randomized, 66 (38%) are out of the follow-up phase and have completed all follow-up assessments; 71 (40%) are out of the follow-up phase and have completed at least one follow-up assessment; 30 (17%) are out of the follow-up phase and did not complete any follow-up assessment; and 8 (5%) dropped out of the study by explicitly stating that they did not want to complete any follow-up assessment.

Finally, we have completed Task 4 of the SOW. Specifically, data entry, cleaning, and all fidelity has been completed. Main outcome analyses have been accepted to Depression and Anxiety and currently in press, in addition to several other subsequent papers underway. The study team worked primarily to analyze and disseminate study findings. Further, the PI, co-investigators, and other research study staff will continue to work on publishing articles related to this project and to present at national scientific conferences. Additionally, the project PI will continue collaborations with the parallel in-home study (CPT; Co-PIs Drs. Peterson and Resick) and will specifically work to develop a shared repository in the last phase of the study, which will include both study databases. To date, we have received IRB approval to collapse both study databases and conduct analyses.

KEY RESEARCH ACCOMPLISHMENTS:

- All enrollment and recruitment efforts have been completed because the target study sample has been recruited.
- We have obtained VA San Diego IRB and R&D Approval to conduct our study (IRB #H130390).
- HRPO has provided initial approval (and most recent re-approval in October 2018).
- We have purchased equipment and supplies for the project, prepared paperwork, including all research dissemination efforts.
- All treatment and assessment fidelity were completed.
- Data analyses for all phases and components of study have begun and are underway. Specifically, all data has been cleaned and some have been analyzed. All efforts are now being placed toward data analysis and dissemination efforts.
- Data analyses for the primary outcome paper have been completed with the primary outcome paper in press.
- The PI, co-investigators, and other research study staff will continue to work on publishing articles related to this project and to present at national scientific conferences.
- Collaboration with Drs. Resick and Peterson's parallel study has begun. Overlapping clinical outcome variables have been identified, codebook was created for the new collapsed database, DUA has been set up, and plan was made to create a new collapsed database with data from two parallel studies.

REPORTABLE OUTCOMES:

Patents and licenses applied for and/or issued;

- None

Degrees obtained that are supported by this award;

- Student Stephanie Wells obtained her Doctorate Degree of Science in Clinical Psychology from the San Diego State University/University of California San Diego Joint Doctoral Program in Clinical Psychology from the support provided by this award.

Development of cell lines, tissue, or serum repositories;

- N/A

Informatics such as databases and animal models, etc.;

- An Access Database has been created for use of the present study data entry.

Funding applied for based on work supported by this award;

- Not in the past year, however, in the previous year, the Frank W. Putnam trauma Research Scholar award was awarded to help fund student Stephanie Wells' dissertation project which involved conducting qualitative interviews with participants following their completion of this study to better understand why Veterans prematurely dropped out of therapy

Employment or research opportunities applied for and/or received based on experience/training supported by this award.

- None

CHALLENGES:

Our previous challenges from the VA Choice program, as well as the federal government hiring freeze did not affect the present study within the last year due to completion of study recruitment. However, we did still face a few challenges. Specifically, this study faced the unanticipated interruptions to VA-wide technology available to Veterans. Specifically, the VA nationwide has completed the nation-wide transition from Jabber, a secure video teleconferencing tool commonly used by the VA, to a new video teleconferencing system (i.e., Virtual Medical Room [VMR]). Though the transition to VMR did remove some of the problems experienced (nationwide) by Veterans who used Jabber, the rollout was not seamless and resulted in multiple connection issues, often resulting in dropped connections to a point of therapy sessions not being completed and needing to be rescheduled. However, as more issues with VMR continued to be resolved, these issues diminished throughout the remaining sessions with the final active participants.

It is also worth noting that this study continued to be directly impacted by San Diego VA Healthcare System infrastructure over the course of the past year. Particularly, this VA continues to work to improve the infrastructure of the Veterans and their healthcare experience, which includes more accessible and plentiful parking for Veterans to come to the primary VA Medical Center campus in La Jolla, CA. Specifically, the VA has significantly reduced the amount of available parking not only for VA staff and providers, but for patients as well. Veterans are required to come to the VA for their clinical assessments and if they were randomized to the OBT condition. Unfortunately, Veterans reported that they chose to not

attend therapy sessions and post assessments because of parking difficulties. These barriers to seeking and remaining in care provide additional support that research on home-based and telehealth modalities is needed and timely.

CONCLUSION

At the end of year 6 of this study, we have enrolled and completed study participation for 100% of the study's sample size (N=175). Specifically, we have completed all study therapy and post-assessments. Our database has been cleaned, study fidelity is complete, and is currently being used for all dissemination efforts. Additionally, the main outcome paper for this study has been accepted and is in press with *Depression and Anxiety*. We have presented study data at numerous national and international conferences. Additionally, the data from this study will be used to publish on additional outcomes from study participation. A larger collapsed database is in process of being built which will yield additional analysis and subsequent publications. We have completed all required components of our last Task for this trial in our final year.

The primary aim of this study was to compare the relative reductions in the severity of symptoms of PTSD across the three treatment modalities. To examine this, we hypothesized that the IHIP condition will demonstrate greater reductions in the severity of PTSD symptoms relative to the OB or HBT modalities, while OB and HBT will not differ significantly from each other. This hypothesis was addressed through the research findings on our main outcome paper accepted and in press in the *Depression and Anxiety* journal (Appendix A). The results from this main analysis did not support the main hypothesis as there were no significant main effects for treatment condition and no significant interaction between treatment condition and time for Clinician Administered PTSD Scale for DSM-5 (CAPS-5) scores. However, there was a significant main effect for time across all conditions where CAPS-5 scores decreased by 20.7 points (95% CI = -24.3, -17.1; $p < .001$) at post-treatment and by 18.5 points (95% CI = -22.2, -14.9; $p < .001$) at 6-month follow-up (Morland, 2019). PE showed large effect sizes across all modalities in this study ($d = 0.96-1.08$ at post-treatment and $d = 0.84-0.96$ at 6-month follow-up), and the reduction in CAPS-5 score was maintained over time through 6-month follow-up (Morland, in press). PE showed large effect sizes across all modalities in this study ($d = 0.96-1.08$ at post-treatment and $d = 0.84-0.96$ at 6-month follow-up), and the reduction in CAPS-5 score was maintained over time through 6-month follow-up (Morland, in press). These results showed that there was no significant benefit to choosing one of the three modalities over others, not even the IHIP condition where the therapist visited the patient's home to deliver care. In fact, all three modalities were shown to have a sizable treatment effect in reducing PTSD symptoms and maintaining that improvement, implying that PE can be effective for Veterans seeking PTSD care no matter what setting it is delivered in.

Further, the secondary aims of the study were explored through examining clinical outcomes such as depression and anxiety, improvements in psychosocial functioning, relative cost-effectiveness of the different modalities, process variables such as satisfaction and adherence, and treatment completion rate. Comorbid anxiety and depressive symptoms are a problem for many Veterans with PTSD experience. In this sample, changes in anxiety and depressive symptoms over pretreatment to posttreatment and 6-month follow-up were measured by the Beck Anxiety Index (BAI) and the Beck Depression Index-II (BDI-II). For anxiety, there was no significant treatment condition by time interaction effects (IHIP vs. OBT: Mean diff. = -2.0, Wald $Z = -0.83$, $p = .41$; IHIP vs. HBT: Mean diff = 1.2, Wald $Z = 0.49$, $p = .62$). IHIP did not differ significantly from both OB and HBT which did not support the hypothesis that IHIP condition will show greater reduction in anxiety symptoms over time relative to OB or HBT. Just like PTSD symptoms, however, there was a significant reduction in anxiety symptoms across all treatment

modalities pretreatment to posttreatment maintaining its improvement to 6-month follow-up (pre- to post-: Mean diff. = -9.2, Wald Z = -3.70, $p < .001$; pre- to 6-month: Mean diff. = -8.3, Wald Z = 3.23, $p < .001$). This pattern can be explained by the fact that PTSD and anxiety share a lot of similar characteristics in terms of symptomatology and that PE targets the physiological reactions of PTSD through desensitization which also targets more generalized anxiety. However, we were able to find a unique pattern in how veterans in this sample responded to the treatment and the three modalities by their depression symptoms. There was a significant treatment condition by time interaction for BDI-II scores. This study found significantly higher BDI-II scores in the OBT condition at post-treatment (95% CI = 0.85, 15.17; $p = .028$) and at 6-month follow-up (95% CI = 0.03, 14.61; $p = .049$) than in the IHIP condition given that there were no significant differences in the scores at pretreatment between these conditions (Morland, in press). Scores for the HBT condition did not statistically differ from either the IHIP or the OBT conditions. This partially supported the hypothesis that IHIP will show greater reductions in depressive symptoms than OB or HBT while OB and HBT will not significantly differ from each other. IHIP did show greater reductions than OBT, while HBT did not differ from IHIP or OBT showing a slightly graded fashion in the relative symptom reductions of depression in these three modalities. The effect size estimates for BDI-II scores varied among conditions with IHIP showing moderate reductions ($d=0.48-0.52$), HBT showing small to moderate reductions ($d = 0.28-0.39$), and OBT showing small reductions in OBT ($d=0.18-0.19$; Morland, in press). Other secondary outcomes such as psychosocial functioning, client satisfaction, and treatment adherence also showed a similar pattern where there was excellent main effect for time, but no treatment condition by time interaction. For psychosocial functioning, brief inventory of psychosocial functioning (B-IPF) was used to measure veterans' improvement in functional impairment from pretreatment to posttreatment and then to 6-month follow-up. There were no differences among treatment conditions, but significant improvement in impairment over time across all modalities (pre- to post-: Mean diff. = -7.1, Wald Z = -3.40, $p = .001$; pre- to 6-month: Mean diff. = -6.1, Wald Z = -2.86, $p = .004$). Also for client satisfaction, measured by Client Satisfaction Questionnaire – 8 items (CSQ-8) there was no significant interaction effects between treatment condition and time, but a significant main effect on time was found with the client satisfaction significantly increasing from session 2 to session 15 (Mean diff. = 1.7, Wald Z = 2.45, $p = .02$). For adherence, homework adherence measured each session by the therapist using the standard form from the PE manual and all treatment modalities showed excellent adherence with HBT at 95.0%, OBT at 94.4%, and IHIP at 95.0% (total = 94.8%) with no significant differences across conditions. To date we have not conducted cost analyses, however, we anticipate looking at cost in future analyses.

As per treatment dropout rates, a binary logistic regression analysis showed that participants in both HBT (odds ratio [OR] = 2.67, 95% CI = 1.10, 6.52; $p = .031$) and OBT (OR = 5.08; 95% CI = 2.10, 12.26; $p < .001$) were significantly more likely to drop out of treatment than participants in IHIP condition which supported Hypothesis 2 (Morland, in press). Another significant factor that predicted dropout was older age of entry into military service (OR = 1.14, 95% CI = 1.01, 1.28, $p = .036$) where average age of entry was 20.0 years ($SD = 2.87$; range = 17-31 years; Morland, in press). These results showed that, on average, all participants experienced improvements across primary and secondary clinical outcomes, independent of treatment modality, and these improvements were maintained over time with no statistical difference across conditions in both self-reported and clinician-assessed PTSD symptoms (Morland, in press). Over half of the sample lost their PTSD diagnosis immediately after treatment (57.3%) and most maintained this improvement at 6-month post-treatment (50.2%; Morland, in press). Participants in the OBT condition reported significantly worse improvement in depression at post-treatment and 6-month follow-up compared to those in IHIP condition. Self-rated PTSD and depression showed more modest improvements over time in comparison to clinician-rated PTSD symptoms which is

inconsistent with the extant PE literature, however, the discrepancy between clinicians' and patients' ratings of symptom change is not uncommon (Morland, in press). A notable finding in this study is the differences in dropout rate across conditions. This finding speaks to the barriers to care in OBT and HBT modalities where there are technological issues of telehealth and difficulty in visiting the clinic in person, especially with the accessibility issues that arose in San Diego VA Healthcare System's infrastructure during the duration of the study (see Challenges). Furthermore, there may have been a higher level of accountability and provider control over attrition in the IHIP condition where it makes it more difficult for patients to "no-show" or avoid attending the therapy sessions when a provider is scheduled to come directly to a patient's home. This means that there is a promising aspect to the IHIP condition in terms of attrition although it may be more costly to deliver this modality, decreasing its scalability compared to the other conditions (Morland, in press).

The difference in dropout rates across conditions and the finding that there is no significant difference in symptom reduction effect sizes across conditions implies that the modality in which a treatment is delivered has a huge impact on veterans with PTSD in clinical settings. This is also demonstrated in a secondary publication on veteran's preferences of modalities published from this study in *Military Medicine* journal in 2019 (Appendix B). In this study, veterans were given a forced choice treatment delivery modality questionnaire developed by study investigators to evaluate veterans' preferences for receiving PE prior to randomization. The questionnaire included a brief summary of each modality and instructions to rank first, second, and third choice (i.e., OBT, HBT, IHIP). A one-sample Chi-square test showed that there were differences in rates of preference among the participants ($X^2[2] = 8.23, p = 0.01$), but no treatment modality received a clear majority preference in the sample with 77 (42.8%) veterans choosing HBT, 57 (31.7%) choosing IHIP, and 46 (25.6%) choosing OBT (Morland, 2019). In pairwise comparisons, HBT was significantly preferred over OBT ($p = 0.01$), while differences between IHIP and OBT and differences between IHIP and HBT were not statistically significant ($p = 0.32, p = 0.10$, respectively; Morland, 2019). These results indicate that veterans have notable interest in all three modalities suggesting that in terms of treatment delivery modality, it is not a one-size-fits-all situation. In regard to clinic implications, there may be benefit in offering a range of options for accessing care for veterans seeking PTSD treatments. Veterans also preferred HBT to OBT which implies that most veterans are open to utilizing technology at home using telehealth services which can increase access to care, reduce stigma visiting the clinic, and help overcome logistical and environmental barriers to care (Morland, 2019).

With these research findings, the current study found that PE is effective in reducing PTSD symptoms no matter which delivery modality is utilized. However, clear differences in modality preference and attrition rates were found across conditions suggesting that expanding treatment delivery options through a patient-centered and flexible approach may increase veterans' willingness to seek and remain in therapy (Morland, 2019). Further studies should evaluate unique opportunities and challenges in the IHIP condition such as safety precautions for therapists visiting the veterans' homes.

REFERENCES:

Publications:

- Morland, L. A., Mackintosh, M., Glassman, L. H., Wells, S. Y., Thorp, S. R., Rauch, S. A. M., Cunningham, P. B., Tuerk, P. W., Grubbs, K. M., Golshan, S., Sohn, M., & Acierno, R. (in press). Home-based delivery of variable length prolonged exposure therapy: A comparison of clinical efficacy between service modalities. *Depression and Anxiety*.
- Morland, L. A., Wells, S. Y., Glassman, L. H., Grubbs, K., Mackintosh, M. A., Golshan, S., Sohn, M., Thorp, S. R., Savage, U., & Acierno, R. (2019). What do veterans want? Veterans' preferences for PTSD treatment delivery modality. *Military Medicine*.
- Wells, S. Y. (2018). Examining Dropout from Prolonged Exposure Therapy in Veterans with Posttraumatic Stress Disorder: A Mixed-Methods Study (Doctoral dissertation, UC San Diego).

Presentations:

- Wells, S. Y., Aarons, G. A., Glassman, L. H., Jaime, K., Martinez Ceren, P., Schnitzer, J. S., Chiong, C., Mackintosh, M. A., Tu, X., Hurst, S., & Morland, L. A. (2019, November). Examining veterans' reasons for dropping out of prolonged exposure therapy: A mixed-methods study. Poster presented at the 35th annual meeting of the International Society for Traumatic Stress Studies (ISTSS), Boston, MA.
- Mackintosh, M., Glassman, L. H., Tedesco, A., Khalifian, C. E., Sohn, M. J., & Morland, L. A. (2019, November). Impact of prolonged exposure on common PTSD-related complaints among veterans: Changes in anger and sleep concerns and their impact on veteran functioning. Poster presented at the 35th annual meeting of the International Society for Traumatic Stress Studies (ISTSS), Boston, MA.
- Morland, L. A., Wells, S.Y., & Grubbs, K. (2018, November). Home-based delivery of PE therapy: Clinical efficacy of Service Modalities. Symposium to be presented at the 52nd annual Association for Behavioral and Cognitive Therapies (ABCT), Washington D.C
- Wickramasinghe, I.A., Bosch, J., Jaime, K., Morland, Martinez Ceren, P., Morland, L.A. (2018, November). Examining the impact of childhood trauma on PTSD symptoms and psychosocial functioning in a sample of male veterans. Poster to be presented at the 34th annual International Society for Traumatic Stress Studies (ISTSS), Washington DC.
- Sohn, M., Gutierrez Chavez, M., Wells, S. Y., Armstrong, M. R., Golshan, S., & Morland, L. A. (2018, November). Differences in clinical presentation of high trauma-related guilt group and low trauma-related guilt group in a sample of veterans with posttraumatic stress disorder. Poster session to be presented at the 34th annual convention of the International Society for Traumatic Stress Studies (ISTSS), Washington, D.C
- Wells, S. Y., Grubbs, K., Glassman, L. H., Sohn, M., Savage, U., Chatfield, M., Wickramasinghe, I., Golshan, S., & Morland, L. A. (2017, November). Examining dropout from prolonged exposure in a veteran sample. Oral presentation at the 33rd Annual International Society for Traumatic Stress Studies (ISTSS), Chicago, IL.
- Morland, L. A., Wells, S. Y., Sohn, M., Savage, U., Glassman, L. H., Grubbs, K., Golshan, S., Thorp, S. R., & Acierno, R. (2017, October). What do veterans want? Understanding veteran's preferences for PTSD treatment delivery. Oral presentation at the 2nd Annual San Antonio Combat PTSD Conference, San Antonio, TX.
- Morland, L. A., Wells, S. Y., Howard, I. C., Mikhael, T., Savage, U., Tunze, C. A., Sohn, M., Walter, K. H., & Thorp, S. R. (2015, November). Preliminary findings from a study of home-based psychotherapy for posttraumatic stress disorder. Poster presented at the 31st Annual International Society for Traumatic Stress Studies (ISTSS), New Orleans, LA.

- Morland, L. A., Poizner, J. M., Williams, K. E., Masino, T. T., & Thorp, S. R. (2015). Home-based clinical video teleconferencing care: Clinical considerations and future directions. *International Review of Psychiatry*, 27(6), 504-512.

APPENDICES:

Appendix A

Home-based Delivery of Variable Length Prolonged Exposure Therapy: A Comparison of Clinical Efficacy Between Service Modalities

Leslie A. Morland, Margaret-Anne Mackintosh, Lisa H. Glassman, Stephanie Y. Wells, Steven
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Data Availability Statement: The data that support the findings of this study are available on
request from the corresponding author. The data are not publicly available due to privacy or
ethical restrictions.

Abstract

Objective: This study examined clinical and retention outcomes following variable length prolonged exposure (PE) for posttraumatic stress disorder (PTSD) delivered by one of three treatment modalities (i.e., home-based telehealth [HBT], office-based telehealth [OBT], or in-home-in-person [IHIP]).

Method: A randomized clinical trial design was used to compare variable length PE delivered through HBT, OBT, or IHIP. Treatment duration (i.e., number of sessions) was determined by either achievement of a criterion score on the PTSD Checklist for DSM-5 (PCL-5) for two consecutive sessions or completion of 15 sessions. Participants received PE via HBT ($n = 58$), OBT ($n = 59$) or IHIP ($n = 58$). Data were collected between 2012 and 2018, and PTSD was diagnosed using the Clinician Administered PTSD Scale for DSM-5 (CAPS-5), administered at baseline, post-treatment, and six-months following treatment completion. The primary clinical outcome was CAPS-5 PTSD severity. Secondary outcomes included self-reported PTSD and depression symptoms, as well as treatment drop-out.

Results: The clinical effectiveness of PE did not differ by treatment modality across any time point; however, there was a significant difference in treatment dropout. Veterans in the HBT (OR = 2.67, 95% CI = 1.10, 6.52, $p = .031$) and OBT (OR = 5.08, 95% CI = 2.10, 12.26, $p < .001$) conditions were significantly more likely than veterans in IHIP to drop out of treatment.

Conclusions: Providers can effectively deliver PE through telehealth and in-home, in-person modalities although rate of treatment completion was higher in IHIP care.

Keywords: PTSD, clinical trials, trauma, health services, empirical supported treatments

Trial Registration: ClinicalTrials.gov identifier: NCT03110302

Home-based Delivery of Prolonged Exposure Therapy: A Comparison of Clinical Efficacy Between Service Modalities

Posttraumatic stress disorder (PTSD) is a chronic condition associated with significant impairments in mental and physical health (Ramsawh et al., 2014; Schnurr, 2017; Smith, Goldstein, & Grant, 2016; Taft, Creech, & Murphy, 2017). Although there has been improvement in the availability of psychological interventions for PTSD, prevalence estimates remain high among veterans (7-20%; Dohrenwend et al., 2006; Richardson, Frueh, & Acierno, 2010; Seal et al., 2009; Smith et al., 2016), while evidence-based treatment initiation and completion remain low (e.g., Kehle-Forbes, Meis, Spont, & Polusny, 2016; Maguen et al., 2019). Improving access to high-quality care remains a top priority within the Veteran's Health Administration (VHA).

The Department of Veterans Affairs/Department of Defense (VA/DoD) Clinical Practice Guideline for Management of Posttraumatic Stress (Veterans Health Administration & Department of Defense, 2017) recommends several evidence-based treatments (EBTs) for PTSD, including prolonged exposure therapy (PE). Even though the VHA offers these interventions at low or no cost for most veterans, veterans report several barriers to care, including fear of stigma, transportation, long wait times, lack of knowledge about eligibility for services, and insufficient care in rural communities (Fortney, Burgess, Bosworth, Booth, & Kaboli, 2011; Hundt et al., 2018; Ouimette et al., 2011; Sayer et al., 2009). These barriers can greatly impact the availability and quality of care that veterans receive in the VA; only 9-13% complete an adequate dose of an EBT (Maguen et al., 2019; Sripada, Bohnert, Ganoczy, & Pfeiffer, 2018). More research is needed to develop treatment modalities that reduce barriers and improve access to care.

The VA has invested significant resources into innovative modalities of service delivery to ensure convenient and timely access to treatment. Clinical video teleconferencing (CVT; Department of Veterans Affairs, 2018) allows veterans to obtain mental health services remotely while being located at a VA clinic (office-based telehealth; OBT) or within their homes (home-based telehealth; HBT). Office-based telehealth can decrease barriers to care, including reduced travel time to a main VA medical center, transportation costs, and can improve access to specialty providers located remotely. Office-based telehealth is non-inferior (i.e., equivalent) to traditional face-to-face care for the delivery of PTSD EBTs (e.g., Morland et al., 2014; Morland et al., 2015). More recently, the VA has expanded their telehealth services to include home-based CVT, which can eliminate even more barriers than office-based telehealth (e.g., travel time, transportation costs, or perceived stigma), facilitate social support and rapport, and provide useful personal information for treatment (e.g., ideas for behavioral activation). Two recent studies found evidence-based PTSD treatments delivered via home-based CVT were non-inferior (i.e., equivalent) to treatment delivered through traditional in-person care, and rates of attrition were similar (Acierno et al., 2016; Acierno et al., 2017). A direct comparison between home-based telehealth and other modalities is needed to confirm that outcomes from home-based telehealth are comparable to other types of care.

The VA's efforts to widely implement office and home-based CVT could transform the delivery of PTSD care. However, there is still a need to develop and evaluate other novel delivery modalities, such as in-home, in-person care (IHIP), where the therapist travels to the veteran's home, for PTSD services. The VA has implemented IHIP services through the Home-Based Primary Care program for older veterans (Karlin & Karel, 2014); however, these services are not typically available for younger veterans and do not primarily provide PTSD care.

Expanding VA mental health services to include IHIP for a broader veteran population and specialty mental health services , may increase access while decreasing attrition. Further, IHIP shares many of the benefits of home-based CVT (e.g., greater rapport; Pruitt, Luxton, & Shore, 2014) and potentially offers even more opportunities for the therapist to personalize care (e.g., use information from the veteran’s environment to inform homework assignments) and may also improve treatment outcomes and engagement.

The present study was a three-arm randomized clinical trial (RCT) comparing the outcomes of OBT, HBT, and IHIP. The primary hypothesis tested whether veterans in the IHIP condition would have greater reductions in clinician-rated PTSD symptoms compared to veterans in the OBT and HBT conditions. Secondary hypotheses predicted that veterans in the IHIP condition would show greater improvements in secondary clinical outcomes (i.e., PTSD, depression symptoms) and higher completion rates compared to the other two conditions as IHIP therapists treat PTSD symptoms in a naturalistic context. Studies to date have not directly compared HBT to OBT; we expect similar outcomes between these two active comparators.

Method

Veterans provided written informed consent before enrollment. Recruitment, assessment, and treatment occurred between 2013 and July 2018. The VA San Diego Healthcare System Institutional Review Board approved the protocol.

Participants

The study enrolled 175 veterans (see Figure 1 for CONSORT table). Veterans had to meet criteria for PTSD based on the Diagnostic and Statistical Manual-5 (*DSM-5*; American Psychiatric Association, 2013), reside within a 35-mile radius of the San Diego VA Medical Center, and have a specific memory of the traumatic event and access to a telephone (Wi-Fi

enabled tablets were provided, as needed). Eligibility also required a stable regimen of psychotropic medications, if taken, for at least 60 days. Exclusion criteria included concurrent PTSD or exposure treatment for other psychological disorders as reported by veterans and VA electronic medical records (EMR) chart review, untreated and unmanaged (i.e., unwilling to decrease or abstain from) substance use disorders in the past 60 days as assessed by veteran's self-report, the Alcohol Use Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001), and EMR chart review, medication non-compliance or abuse, psychiatric hospitalization in the past year determined by veterans' self-report and a VA EMR chart review, or incarceration in the past year as reported by the veteran, severe physical disease or disorders that would interfere with the ability to participate in therapy, unmanaged dementia, psychosis or mania in the past year as reported by the veteran and a VA EMR chart review, a suicide attempt in the past year as reported by the veteran and a VA EMR chart review, registered sex offender status as reported by the veteran, and perpetration of sexual or physical assault in the past five years as reported by the veteran and a VA EMR chart review.

Procedures

Recruitment and randomization. Veterans were recruited from the San Diego VA Healthcare System medical center and local community-based outpatient clinics. After a phone screen and a baseline assessment to determine eligibility, veterans were randomized to one of the three treatment conditions. Randomization was balanced within therapists, using blocks of decreasing sizes to maintain an approximate balance in the sample sizes for the three arms. Each therapist delivered PE in all three modalities.

Assessments. Veterans completed in-person assessments at baseline, post-treatment, and six-month follow-up. All clinician-administered assessments were conducted by masters or

doctoral level independent clinical evaluators blinded to the treatment condition and were trained to administer the Clinician-Administered PTSD Scale for *DSM-5* (CAPS-5; Weathers, Blake, et al., 2013). Veterans completed self-report measures at each assessment. Additionally, veterans completed the PCL-5 and Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996) at each treatment session.

Treatment. Therapists provided individual PE approximately once-weekly in 90-minute sessions. PE includes psychoeducation, breathing retraining, imaginal exposure, and in-vivo exposure (Foa, Hembree, & Rothbaum, 2007). The standard PE protocol was used with the addition of a discussion of the novel formats, the clinical interview, and motivational enhancement language. Thus, in-session imaginal exposures started in session four. Therapists recorded therapy sessions for treatment fidelity. Therapist protocol adherence was excellent for HBT (95.0%), OBT (94.4%), and IHIP (95.0%) protocols (total = 94.8%) with no significant differences across the conditions.

The study utilized a variable length design (6 to 15 sessions), which was dependent on treatment response. Veterans were considered *early responders* and could graduate before attending 15 sessions if they completed at least six sessions of PE and had PTSD Checklist for *DSM-5* (PCL-5; Weathers, Litz, et al., 2013) scores below 21 for two consecutive sessions. During the study, the clinical cutoff for the PCL-5 was revised based on new data regarding the PCL-5 norms, and the study's definition of treatment graduation for early treatment termination was updated to match relevant clinical practice. Thus, a small portion of veterans ($n = 28$) graduated "prematurely" using a PCL-5 cut-off score of 30. Treatment completion was defined as completing eight or more sessions, which is considered an adequate dose (Ready, Lamp, Rauch, Astin, & Norrholm, 2018). Dropout was defined as completing fewer than eight sessions

but not meeting the definition of an early responder. Therapists could conduct off-protocol sessions to manage clinical emergencies that did not count as a PE session.

Measures

Primary clinical outcome. The 30-item CAPS-5 determined PTSD diagnosis and severity. Total scores range from 0 to 80. The CAPS-5 has demonstrated high internal consistency ($\alpha = .88$) and strong test-retest reliability ($ICC = .78$) among veterans (Weathers et al., 2018). Fifteen percent of CAPS-5 interviews were randomly selected for fidelity ratings and interrater reliability between the original CAPS-5 assessors and expert fidelity raters for severity scores was excellent ($ICC = .99$). Cronbach's alphas for severity scores ranged from 0.74 to 0.92 at the three primary assessment points.

Secondary clinical outcomes.

PCL-5 (Weathers, Litz, et al., 2013). The PCL-5 is a 20-item self-report measure assessing *DSM-5* PTSD symptoms during the last month. Total sum scores range from 0 to 80. Cronbach's α in this study ranged from 0.84 to 0.97.

Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a 21-item, self-report questionnaire assessing depressive symptoms in the last two weeks. Items are summed to a severity rating; scores below 13 indicate minimal depression, 14 to 19 mild depression, 20 to 28 moderate depression, and 29 to 63 severe depression (Beck et al., 1996). Cronbach α in this study ranged from 0.89 to 0.96.

Predictors of treatment dropout. The following self-report measures completed at primary assessment points were used to predict treatment dropout.

Beck Anxiety Inventory (BAI; Beck, Epstein, Brown & Steer, 1988). The 21-item BAI assess anxiety symptoms experienced in the past month. Summed item severity ratings below 21

indicate low anxiety, 22 to 35 indicate moderate anxiety, and greater than 35 indicate high anxiety (Beck et al., 1988). Cronbach's α in this study ranged from 0.90 to 0.94. Pre-treatment means (*SD*) were 27.4 (11.65), 28.4 (11.43), and 25.5 (11.58) for IHIP, HBT, and OBT, respectively.

Brief Inventory of Psychosocial Functioning (B-IPF; Kleiman et al., 2018). On the B-IPF participants use a seven-point scale rate their difficulties in seven areas of functioning in the past 30 days with higher scores representing poorer functioning. Cronbach's α in this study ranged from 0.67 to 0.79. Pre-treatment means (*SD*) were 29.4 (8.56), 29.2 (9.12), and 28.4 (8.71) for IHIP, HBT, and OBT, respectively.

Statistical Analyses

All analyses used the intent-to-treat sample. Mixed models were used to test hypotheses for all outcomes (i.e., CAPS-5, PCL-5, and BDI-II). These models included fixed effects for treatment condition, time, and the treatment condition by time interaction. Therapists were treated as a random effect. Unstandardized parameter estimates with 95% confidence intervals (CI) along with Wald test statistics are presented. The parameter estimates represent mean differences from the comparator condition. Effect size (Cohen's *d*) was calculated using pre-treatment to follow-up assessment on-average differences divided by the pooled standard deviation. Because of the refinement in the definition of early treatment graduation, sensitivity analyses were conducted by assessing differences in the pattern of results based on participants who graduated under the old and new graduation definitions (see endnote 2).

Treatment dropout (yes/no) was analyzed using binary logistic regression. Predictors of treatment dropout were treatment condition, military service characteristics (i.e., age that the

veteran entered military service and satisfaction with military service rating), and baseline symptom scores (i.e., pre-treatment scores CAPS-5, BDI-II, BAI, and B-IPF scores).

To address missing data, we used an inclusive analysis strategy to identify auxiliary variables to be included in the multiple imputation models (Enders, 2017). Parameter estimates were averaged over the 100 datasets imputed. The large number of datasets was selected to stabilize the imputed values in the analysis stage, which is important in estimating treatment differences with longitudinal data (Lu, 2017). Analyses were conducted using SPSS.

Results

Study Participants

Table 1 provides demographic and baseline descriptive information for the 175 participants in the intent-to-treat sample.

Before the intervention, treatment groups differed only in that a greater number of Navy veterans were randomized to the IHIP condition compared to OBT and HBT, $\chi^2(2) = 9.14, p = .010$. All analyses initially controlled for Navy veteran status. Because there were no significant differences in results based on the inclusion of Navy status, the variable was dropped, and we report the simplified results.

Clinical Outcomes

Means (and Cohen's *ds*) on all clinical outcomes decreased from pre- to post-treatment and most gains appear to be maintained over time (see Table 2). Supplemental Table 1 details results from the mixed models assessing the impacts of treatment condition, time, and their interaction on each outcome.

CAPS-5 scores. Neither a significant main effect for treatment condition nor a significant interaction between treatment condition and time was identified, $ps > .385$. Thus, the primary

hypothesis was not supported. However, there was a significant main effect for time, indicating that on average across conditions, CAPS-5 scores decreased by 20.7 points (95% CI = -24.3, -17.1, $p < .001$) at post-treatment and by 18.5 points (95% CI = -22.2, -14.9, $p < .001$) at six-month follow-up. These represent large effect sizes that were maintained over time ($d = 0.96 - 1.08$ at post-treatment and $d = 0.84 - 0.96$ at six-month follow-up).

PCL-5 scores. The pattern of results for PCL-5 scores was similar to those for CAPS-5 scores. Neither the main effect for treatment condition nor the treatment condition by time interaction were significant, $ps > .086$. However, there was a significant main effect for time, indicating that on average, PCL-5 scores decreased by 23.6 (95% CI = -30.5, -16.6, $p < .001$) at post-treatment and by 20.6 points (95% CI = -27.7, -13.6, $p < .001$) at six-month follow-up. These changes represent small to moderate effect sizes that were maintained over time ($d = 0.38 - 0.62$ at post-treatment and $d = 0.35 - 0.54$ at six-month follow-up).

BDI-II scores. A significant treatment condition by time interaction was found for BDI-II scores. While there were no differences between IHIP and OBT means at pre-treatment, compared to IHIP scores, the BDI-II scores in the OBT condition were significantly higher at post-treatment (mean = 8.0 points; 95% CI = 0.85, 15.17, $p = .028$) and at six-month follow up (mean = 7.3 points; 95% CI = 0.03, 14.61, $p = .049$). Scores for the HBT condition did not statistically differ from either the IHIP or the OBT conditions. Effect size estimates varied among the conditions with moderate reductions in IHIP ($d = .48 - .52$), small to moderate reductions in HBT ($d = 0.28 - 0.39$), and small reductions in OBT ($d = 0.18 - 0.19$).

Treatment dropout

Table 3 summarizes the results from the binary logistic regression predicting treatment dropout. Compared to IHIP, participants in both HBT ($OR = 2.67$, 95% CI = 1.10, 6.52, $p = .031$)

and OBT ($OR = 5.08$, 95% CI = 2.10, 12.26, $p < .001$) were significantly more likely to drop out. Older age of entry into military service predicted greater risk of dropout, $OR = 1.14$, 95% CI = 1.01, 1.28, $p = .036$. Average age at entry was 20.0 years ($SD = 2.87$, range = 17 – 31 years). None of the other characteristics predicted risk for dropout, all $p > .302$.

PE Treatment Information

Table 4 provides PE treatment information for IHIP, HBT, and OBT conditions. Groups differed on the treatment completion rates, $\chi^2(2) = 14.01$, $p < .001$, and the number of PE sessions completed, $F(2) = 4.95$, $p \leq .01$ with participants in the IHIP condition compared to the OBT condition completing treatment at a higher rate (79.3% vs. 45.8%; $\chi^2(1) = 42.09$, $p < .001$) and attending more PE sessions (9.8 vs. 7.0 sessions, $t(344.7) = 5.54$, $p < .001$), respectively. There were no significant differences among the treatment conditions on the other variables.

Discussion

PE is one of the most widely researched, evidence-based interventions for PTSD. However, there are many barriers to care that prevent veterans from obtaining this treatment. Home-based modalities, including HBT and IHIP, present an important alternative to traditional office-based models; in particular, these would allow specialized PE providers located anywhere in the country to access patients in their homes.

This study compared outcomes of PE delivered through OBT, HBT, and IHIP to examine the efficacy of home-based modalities. Contrary to our hypotheses, IHIP did not outperform HBT or OBT on primary and secondary clinical outcome measures. On average, all participants experienced improvements across primary and secondary clinical outcomes, independent of treatment modality, and these improvements were maintained over time. Further, there were no differences in self-reported and clinician-assessed PTSD symptom change across the three

different conditions. Effect size changes for clinician-assessed PTSD symptoms were large for all three conditions at post-treatment and follow-up. Just over half of the sample lost their PTSD diagnosis immediately after treatment (57.3%) and most maintained this at 6-mo post-treatment (50.2%). The large effect size for clinician-assessed PTSD symptoms is consistent with other veteran samples (Acierno et al., 2017; Schnurr et al., 2007) but smaller than some non-veteran studies (Foa et al., 2005), which is consistent with a meta-analysis that found smaller effect sizes for veterans compared with non-veterans (Watts et al., 2013). Our findings add to the growing evidence from studies of telehealth delivery for PTSD treatment that the in-person dynamic is not necessary for meaningful clinical gain (e.g., Acierno et al., 2016; Acierno et al., 2017; Morland et al., 2014; Morland et al., 2015). This also speaks to the robust nature of PE, regardless of delivery modality, and that PE can be flexibly delivered while maintaining efficacy.

Individuals in OBT reported significantly worse depression at post-treatment and follow-up in comparison to IHIP. When compared to clinician-rated PTSD, self-rated PTSD and depression showed more modest improvements over time with effects ranging from small to moderate. This is not consistent with the extant PE literature; however, discrepancy between clinicians' and patients' ratings of symptom change following treatment is not uncommon (Forbes, Creamer, & Biddle, 2001; Monson et al., 2008). Additionally, clinician-rated instruments, like the CAPS-5, are considered to be a more accurate reflection of true symptom change when compared to self-report measures because patients may underreport improvements in symptoms during therapy (Forbes et al., 2001).

The dropout rates across conditions are one of our most notable findings. As hypothesized, IHIP had a significantly lower dropout rate when compared to OBT and HBT, and when compared to PE delivered in-office in-person at VA clinics (e.g., Eftekhari et al., 2013;

Steenkamp, Litz, Hoge, & Marmar, 2015). This is not surprising given that there are fewer barriers to care in this modality. Furthermore, there may be a higher level of accountability and provider control over attrition. For example, when a provider is scheduled to come to a home, it takes a lot more effort to cancel an appointment; “no-shows” and forgetting an appointment are less likely. This finding is promising because identifying strategies to reduce dropout is important given the high rates of premature dropout from PTSD treatment (Steenkamp et al., 2015). However, IHIP may also be more costly to deliver than the telehealth modalities, which may decrease scalability in large healthcare systems.

In contrast, the dropout rate for the HBT and OBT conditions were higher than expected. Participants in the OBT condition had the highest dropout rates; over half of participants randomized to this condition dropped out of treatment. This may be due, in part, to the fact that veterans encounter significant barriers to care that are associated with coming into the clinic, including individual and system-level barriers (e.g., parking, transportation costs, stigma) while also experiencing barriers specific to CVT, such as technological issues. The existing literature examining veterans’ reasons for dropping out of PE have primarily utilized quantitative methodologies; qualitative interviews with veterans who drop out of PE would provide more useful information.

There are several notable study strengths. We recruited a psychosocially diverse sample from a major urban center with a socioculturally diverse population. Eighty percent of participants reported that they had received prior psychiatric treatment, including psychotherapy; this may more closely match a typical VA sample (Maguen et al., 2019). Neither participants nor providers reported safety issues, regardless of modality with only two reported serious adverse events “possibly” related to study for project duration. Finally, validated assessments were used,

adding to the methodological rigor and our ability to identify change over time.

There are also important limitations to consider. Study parameters (e.g., inclusion/exclusion criteria) limit the generalizability of findings to urban veterans; rural and remote samples were not eligible due to the inclusion radius necessary for IHIP care. We did not allow individuals with a recent suicide attempt or history of perpetration of assault to participate in our study, which may have excluded those with more serious pathology. Finally, our study design did not include a traditional office-based comparison arm; findings cannot be easily compared to traditional care.

This study demonstrates the safety, feasibility, acceptability, and efficacy of an IHIP modality for the treatment for PTSD. Individuals in all three conditions reported statistically significant and clinically meaningful change in PTSD and depression, although those in IHIP were less likely to drop out than individuals in the two comparison conditions or those receiving in-person in-office care at VA outpatient clinics. Before widespread implementation of IHIP throughout the VA Health Care System, additional studies should determine the efficacy of IHIP for other PTSD treatments (e.g., cognitive processing therapy). Additionally, information about the cost-effectiveness of IHIP compared to traditional office-based care and telehealth would also be useful. Finally, stakeholders' (e.g., veterans, providers, administrators) perspectives about this delivery modality should be considered. Nonetheless, future research should extend these findings to rural veterans and consider the impact of delivery modality preference congruence on clinical outcomes. As demand for care continues to increase among veterans, the VA - and community providers - must continue to look outside of traditional models of care in order to provide high-quality, evidence-based practices to those in need.

References

- Acierno, R., Gros, D. F., Ruggiero, K. J., Hernandez-Tejada, B. M., Knapp, R. G., Lejuez, C. W., . . . Tuerk, P. W. (2016). Behavioral activation and therapeutic exposure for posttraumatic stress disorder: A noninferiority trial of treatment delivered in person versus home-based telehealth. *Depression and Anxiety, 33*(5), 415-423.
doi:10.1002/da.22476
- Acierno, R., Knapp, R., Tuerk, P., Gilmore, A. K., Lejuez, C., Ruggiero, K., . . . Foa, E. B. (2017). A non-inferiority trial of prolonged exposure for posttraumatic stress disorder: In person versus home-based telehealth. *Behaviour Research and Therapy, 89*, 57-65.
doi:10.1016/j.brat.2016.11.009
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5 ed.). Arlington, VA: American Psychiatric Publishing.
- Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. (2001). AUDIT: The Alcohol Use Disorders Identification Test: Guidelines for use in primary health care. Geneva, Switzerland: World Health Organization.
- Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology, 56*(6), 893-897. doi:10.1037/0022-006X.56.6.893
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II*. San Antonio, TX: Psychological Corporation.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

- Department of Veterans Affairs. (2018). Authority of health care providers to practice telehealth. Final rule. *Federal Register*, 83(92), 21897-21907.
- Dohrenwend, B. P., Turner, J. B., Turse, N. A., Adams, B. G., Koenen, K. C., & Marshall, R. (2006). The psychological risks of Vietnam for U.S. veterans: A revisit with new data and methods. *Science*, 313(5789), 979-982. doi:10.1126/science.1128944
- Eftekhari, A., Ruzek, J. I., Crowley, J. J., Rosen, C. S., Greenbaum, M. A., & Karlin, B. E. (2013). Effectiveness of national implementation of prolonged exposure therapy in Veterans Affairs care. *JAMA Psychiatry*, 70(9), 949-955. doi:10.1001/jamapsychiatry.2013.36
- Enders, C. K. (2017). Multiple imputation as a flexible tool for missing data handling in clinical research. *Behaviour Research and Therapy*, 98, 4-18. doi:10.1016/j.brat.2016.11.008
- Foa, E. B., Hembree, E. A., Cahill, S. P., Rauch, S. A., Riggs, D. S., Feeny, N. C., & Yadin, E. (2005). Randomized trial of prolonged exposure for posttraumatic stress disorder with and without cognitive restructuring: Outcome at academic and community clinics. *Journal of Consulting and Clinical Psychology*, 73(5), 953-964. doi:10.1037/0022-006x.73.5.953
- Foa, E. B., Hembree, E. A., & Rothbaum, B. O. (2007). *Prolonged exposure therapy for PTSD: Therapist guide*. New York, NY: Oxford University Press.
- Forbes, D., Creamer, M., & Biddle, D. (2001). The validity of the PTSD checklist as a measure of symptomatic change in combat-related PTSD. *Behaviour Research and Therapy*, 39(8), 977-986. doi:10.1016/S0005-7967(00)00084-X

- Fortney, J. C., Burgess, J. F., Jr., Bosworth, H. B., Booth, B. M., & Kaboli, P. J. (2011). A re-conceptualization of access for 21st century healthcare. *Journal of General Internal Medicine*, 26(Suppl 2), 639-647. doi:10.1007/s11606-011-1806-6
- Hundt, N. E., Helm, A., Smith, T. L., Lamkin, J., Cully, J. A., & Stanley, M. A. (2018). Failure to engage: A qualitative study of veterans who decline evidence-based psychotherapies for PTSD. *Psychological Services*, 15(4), 536-542. doi:10.1037/ser0000212
- Karlin, B. E., & Karel, M. J. (2014). National integration of mental health providers in VA home-based primary care: An innovative model for mental health care delivery with older adults. *The Gerontologist*, 54(5), 868-879. doi:10.1093/geront/gnt142
- Kehle-Forbes, S. M., Meis, L. A., Spont, M. R., & Polusny, M. A. (2016). Treatment initiation and dropout from prolonged exposure and cognitive processing therapy in a VA outpatient clinic. *Psychological Trauma: Theory, Research, Practice, and Policy*, 8(1), 107-114. doi:10.1037/tra0000065
- Kleiman, S. E., Bovin, M. J., Black, S. K., Rodriguez, P., Brown, L. G., Brown, M. E., . . . Marx, B. P. (2018). Psychometric properties of a brief measure of posttraumatic stress disorder-related impairment: The Brief Inventory of Psychosocial Functioning. *Psychological Services*. Advance online publication. doi:10.1037/ser0000306
- Lu, K. (2017). Number of imputations needed to stabilize estimated treatment difference in longitudinal data analysis. *Statistical Methods in Medical Research*, 26(2), 674-690. doi:10.1177/0962280214554439
- Maguen, S., Li, Y., Madden, E., Seal, K. H., Neylan, T. C., Patterson, O. V., . . . Shiner, B. (2019). Factors associated with completing evidence-based psychotherapy for PTSD

- among veterans in a national healthcare system. *Psychiatry Research*, 274, 112-128.
doi:10.1016/j.psychres.2019.02.027
- Monson, C. M., Gradus, J. L., Young-Xu, Y., Schnurr, P. P., Price, J. L., & Schumm, J. A. (2008). Change in posttraumatic stress disorder symptoms: Do clinicians and patients agree? *Psychological Assessment*, 20(2), 131-138. doi:10.1037/1040-3590.20.2.131
- Morland, L. A., Mackintosh, M. A., Greene, C. J., Rosen, C. S., Chard, K. M., Resick, P., & Frueh, B. C. (2014). Cognitive processing therapy for posttraumatic stress disorder delivered to rural veterans via telemental health: A randomized noninferiority clinical trial. *Journal of Clinical Psychiatry*, 75(5), 470-476. doi:10.4088/JCP.13m08842
- Morland, L. A., Mackintosh, M. A., Rosen, C. S., Willis, E., Resick, P., Chard, K., & Frueh, B. C. (2015). Telemedicine versus in-person delivery of cognitive processing therapy for women with posttraumatic stress disorder: A randomized noninferiority trial. *Depression and Anxiety*, 32(11), 811-820. doi:10.1002/da.22397
- Ouimette, P., Vogt, D., Wade, M., Tirone, V., Greenbaum, M. A., Kimerling, R., . . . Rosen, C. S. (2011). Perceived barriers to care among Veterans Health Administration patients with posttraumatic stress disorder. *Psychological Services*, 8(3), 212-223.
doi:10.1037/a0024360
- Pruitt, L. D., Luxton, D. D., & Shore, P. (2014). Additional clinical benefits of home-based telemental health treatments. *Professional Psychology: Research and Practice*, 45(5), 340-346. doi:10.1037/a0035461
- Ramsawh, H. J., Fullerton, C. S., Mash, H. B., Ng, T. H., Kessler, R. C., Stein, M. B., & Ursano, R. J. (2014). Risk for suicidal behaviors associated with PTSD, depression, and their

- comorbidity in the U.S. Army. *Journal of Affective Disorders*, 161, 116-122.
doi:10.1016/j.jad.2014.03.016
- Ready, D. J., Lamp, K., Rauch, S. A. M., Astin, M. C., & Norrholm, S. D. (2018). Extending prolonged exposure for veterans with posttraumatic stress disorder: When is enough really enough? *Psychological Services*. Advance online publication.
doi:10.1037/ser0000309
- Richardson, L. K., Frueh, B. C., & Acierno, R. (2010). Prevalence estimates of combat-related post-traumatic stress disorder: Critical review. *The Australian and New Zealand Journal of Psychiatry*, 44(1), 4-19. doi:10.3109/00048670903393597
- Sayer, N. A., Friedemann-Sanchez, G., Spont, M., Murdoch, M., Parker, L. E., Chiros, C., & Rosenheck, R. (2009). A qualitative study of determinants of PTSD treatment initiation in veterans. *Psychiatry*, 72(3), 238-255. doi:10.1521/psyc.2009.72.3.238
- Schnurr, P.P. (2017). Physical health and health services utilization. In S. N. Gold, J. Cook, & C. J. Dalenberg (Eds.), *APA handbook of trauma psychology: Foundations in knowledge* (Vol. 1, pp. 349-370). Washington, DC: American Psychological Association.
- Schnurr, P. P., Friedman, M. J., Engel, C. C., Foa, E. B., Shea, M. T., Chow, B. K., . . . Bernardy, N. (2007). Cognitive behavioral therapy for posttraumatic stress disorder in women: A randomized controlled trial. *JAMA*, 297(8), 820-830.
doi:10.1001/jama.297.8.820
- Seal, K. H., Metzler, T. J., Gima, K. S., Bertenthal, D., Maguen, S., & Marmar, C. R. (2009). Trends and risk factors for mental health diagnoses among Iraq and Afghanistan veterans using Department of Veterans Affairs health care, 2002–2008. *American Journal of Public Health*, 99(9), 1651-1658. doi:10.2105/ajph.2008.150284

- Smith, S. M., Goldstein, R. B., & Grant, B. F. (2016). The association between post-traumatic stress disorder and lifetime DSM-5 psychiatric disorders among veterans: Data from the National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III). *Journal of Psychiatric Research*, 82, 16-22. doi:10.1016/j.jpsychires.2016.06.022
- Sripada, R. K., Bohnert, K. M., Ganoczy, D., & Pfeiffer, P. N. (2018). Documentation of evidence-based psychotherapy and care quality for PTSD in the Department of Veterans Affairs. *Administration and Policy in Mental Health and Mental Health Services Research*, 45, 353-361. doi:10.1007/s10488-017-0828-8.
- Steenkamp, M. M., Litz, B. T., Hoge, C. W., & Marmar, C. R. (2015). Psychotherapy for military-related PTSD: A review of randomized clinical trials. *JAMA*, 314(5), 489-500. doi:10.1001/jama.2015.8370
- Taft, C. T., Creech, S. K., & Murphy, C. M. (2017). Anger and aggression in PTSD. *Current Opinion in Psychology*, 14, 67-71. doi:10.1016/j.copsyc.2016.11.008
- Veterans Health Administration, & Department of Defense. (2017). *VA/DoD clinical practice guideline for management of post-traumatic stress disorder and acute stress disorder*. Washington, DC: Veterans Health Administration and Department of Defense.
- Watts, B. V., Schnurr, P. P., Mayo, L., Young-Xu, Y., Weeks, W. B., & Friedman, M. J. (2013). Meta-analysis of the efficacy of treatments for posttraumatic stress disorder. *Journal of Clinical Psychiatry*, 74(6), e541-550. doi:10.4088/JCP.12r08225
- Weathers, F. W., Blake, D. D., Schnurr, P. P., Kaloupek, D. G., Marx, B. P., & Keane, T. M. (2013). The Clinician-Administered PTSD Scale for DSM-5 (CAPS-5) [Assessment]. Retrieved from www.ptsd.va.gov

Weathers, F. W., Bovin, M. J., Lee, D. J., Sloan, D. M., Schnurr, P. P., Kaloupek, D. G., . . .

Marx, B. P. (2018). The Clinician-Administered PTSD Scale for DSM-5 (CAPS-5): Development and initial psychometric evaluation in military veterans. *Psychological Assessment, 30*(3), 383-395. doi:10.1037/pas0000486

Weathers, F. W., Litz, B. T., Keane, T. M., Palmieri, P. A., Marx, B. P., & Schnurr, P. P. (2013).

The PTSD Checklist for DSM-5 (PCL-5) – Standard [Measurement instrument].

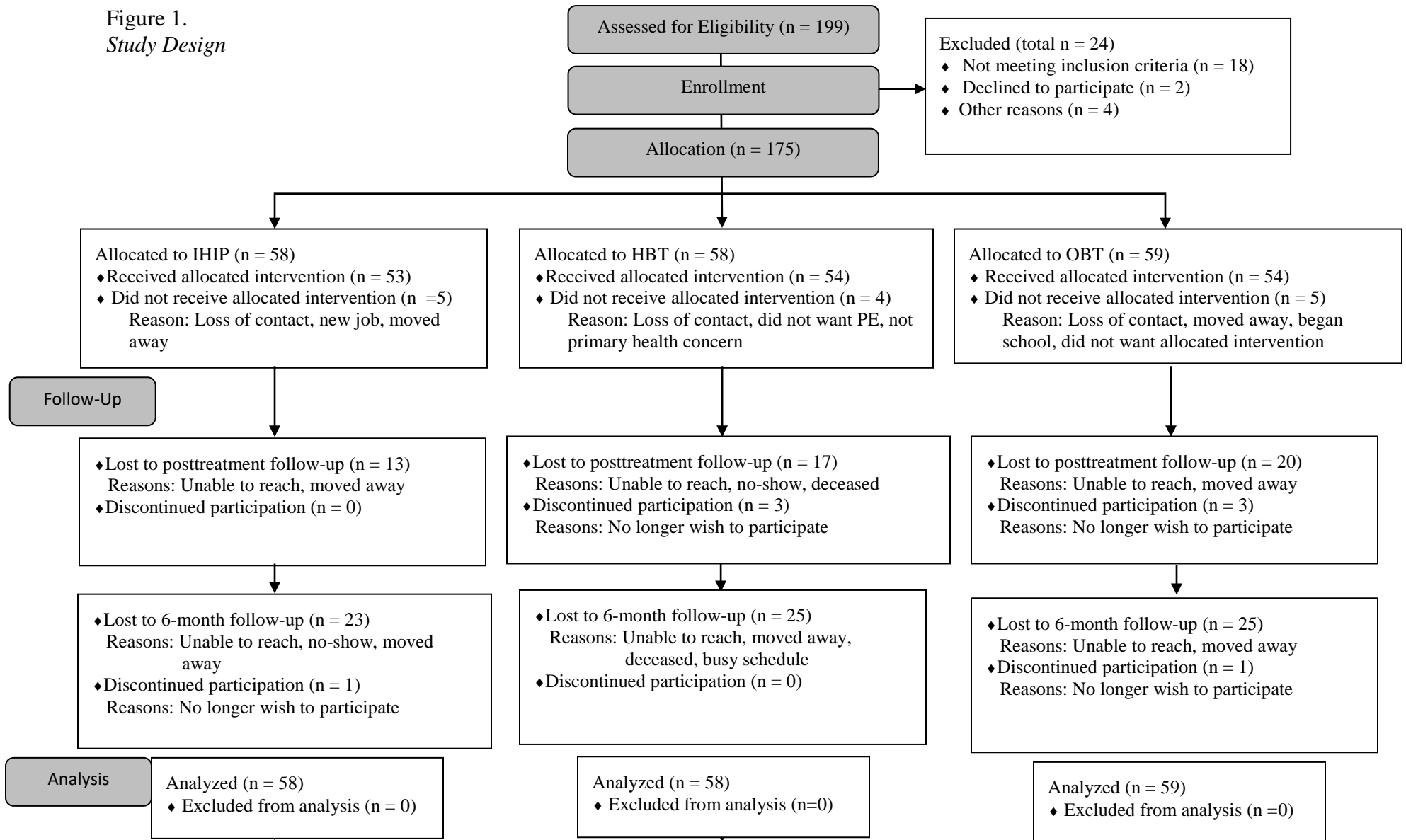
Retrieved from <http://www.ptsd.va.gov/>

Endnotes

1 This study had a change in PI in the 3rd year of the trial from Dr. Steven Thorp to Dr. Leslie Morland.

2 Sensitivity analyses were conducted to investigate effects of the premature graduation sample on the overall patterns of treatment outcomes. There were no differences in the pattern of outcomes when including or excluding the premature graduation sample from analyses. Results presented include the premature graduation sample.

Figure 1.
Study Design



Note. IHIP = in-home, in-person; HBT = home-based telehealth; OBT = office-based telehealth; PE = prolonged exposure

Table 1.
Sample Characteristics for Total Sample and by Treatment Condition

Variable	Total	IHIP	HBT	OBT	Statistical Results
	N = 175	n = 58	n = 58	n = 59	
	<i>n (%)^a</i>	<i>n (%)^a</i>	<i>n (%)^a</i>	<i>n (%)^a</i>	
Gender: Male	131 (74.9%)	41 (71.9%)	44 (75.9%)	46 (78.0%)	$\chi^2(2) = 0.58$
Ethnicity: Hispanic Latino	48 (27.4%)	14 (25.5%)	15 (28.3%)	19 (35.2%)	$\chi^2(2) = 1.30$
Race					$\chi^2(10) = 13.87$
AI/AN	5 (2.9%)	1 (1.9%)	2 (3.8%)	2 (3.6%)	
Black	50 (28.6%)	20 (37.0%)	14 (26.9%)	16 (29.1%)	
White	71 (40.6%)	15 (27.8%)	29 (55.8%)	27 (49.1%)	
Asian American	14 (8.0%)	8 (14.8%)	2 (3.8%)	4 (7.3%)	
NHOPI	4 (2.3%)	2 (3.7%)	0 (0%)	2 (3.6%)	
Other	17 (9.7%)	8 (14.8%)	5 (9.7%)	4 (7.3%)	
Relationship Status					$\chi^2(8) = 6.56$
Single	43 (24.6%)	14 (24.6%)	14 (24.1%)	15 (26.3%)	
Married	94 (53.7%)	33 (57.8%)	28 (48.3%)	33 (57.9%)	
Committed	24 (13.7%)	7 (12.3%)	10 (17.3%)	7 (12.3%)	
Relationship	3 (1.7%)	2 (3.5%)	1 (1.7%)	0 (0%)	
Domestic Partners	8 (4.6%)	1 (1.8%)	5 (8.6%)	2 (3.5%)	
Other					

Employment Status					$\chi^2(14) = 18.99$
Steady Full Time	52 (29.7%)	17 (29.8%)	18 (32.1%)	17 (29.3%)	
Steady Part Time	12 (6.9%)	7 (12.3%)	4 (7.1%)	1 (1.7%)	
Intermittent	5 (2.9%)	2 (3.5%)	0 (0%)	3 (5.2%)	
Retired but working	7 (4.0%)	1 (1.8%)	3 (5.4%)	3 (5.2%)	
Retired but looking	10 (5.7%)	3 (5.3%)	1 (1.8%)	6 (10.3%)	
Retired not looking	35 (20.0%)	7 (12.3%)	17 (30.4%)	11 (19.0%)	
Unemployed and looking	22 (12.6%)	10 (17.5%)	6 (10.7%)	6 (10.3%)	
Unemployed not looking	28 (16.0%)	10 (17.5%)	7 (12.5%)	11 (19.0%)	
Student	50 (28.6%)	15 (26.3%)	15 (26.3%)	20 (33.9%)	$\chi^2(2) = 1.09$
Full Time (vs Part Time)	44 (25.1%)	13 (86.7%)	13 (86.7%)	18 (90.0%)	$\chi^2(2) = 0.13$
Service Connected for PTSD	81 (46.3%)	23 (40.4%)	29 (50.0%)	29 (49.2%)	$\chi^2(2) = 1.32$
Yearly Household Income					$\chi^2(2) = 1.11$
\$30,000 and below	58 (33.9%)	21 (37.5%)	16 (28.6%)	21 (35.6%)	
Above \$30,000	113 (66.1%)	35 (62.5%)	40 (71.4%)	38 (64.4%)	
Service Branches^b					
Air Force	8 (4.6%)	1 (1.8%)	4 (7.0%)	3 (5.1%)	$\chi^2(2) = 1.83$
Army	46 (26.6%)	11 (19.3%)	14 (24.6%)	21 (35.6%)	$\chi^2(2) = 4.12$
Marines	46 (26.6%)	13 (22.8%)	18 (31.6%)	15 (25.4%)	$\chi^2(2) = 1.19$
Navy	78 (45.1%)	35 (61.4%)	21 (36.8%)	22 (37.3%)	$\chi^2(2) = 9.14^*$
Coast Guard	1 (0.6%)	0 (0%)	1 (1.8%)	0 (0%)	$\chi^2(2) = 2.05$
National Guard	7 (4.0%)	2 (3.5%)	3 (5.3%)	2 (3.4%)	$\chi^2(2) = 0.33$
Prior psychiatric treatment	148 (84.6%)	50 (87.7%)	47 (81.0%)	51 (86.4%)	$\chi^2(2) = 1.15$
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	Statistical Results

Age (current)	46.5 (14.11)	46.5 (12.82)	47.3 (14.85)	46.5 (14.11)	$F(2, 173) = 0.20$
Age Entered Military	20.0 (2.87)	20.0 (2.93)	20.0 (3.14)	20.1 (2.59)	$F(2, 172) = 0.01$
Number of Children	1.8 (1.62)	1.9 (1.64)	1.8 (1.62)	1.7 (1.63)	$F(2, 173) = 0.22$
Education (Years)	14.4 (2.01)	14.8 (2.25)	14.1 (1.70)	14.4 (2.04)	$F(2, 173) = 1.52$
Paid Work Hours per Week	15.0 (20.33)	17.2 (21.98)	15.5 (20.47)	12.4 (18.58)	$F(2, 162) = 0.78$

Note. Statistical results displayed in the last column assess differences among the three treatment conditions using chi-square analyses for nominal and ordinal variables and ANOVA with planned comparisons for continuous variables. ^a = not all participants responded to each question; percentages are calculated based on only those who responded. IHIP = In-home, in-person; HBT = Home-based telehealth; OBT = Office-based telehealth; AI/AN = American Indian/American Native; NHOPI = Native Hawai’ian or Other Pacific Islander; Other = other racial groups including multiracial. ^b Veterans could serve in multiple branches; thus, to maintain the independence of observations, data for each service branch was analyzed separately. * = $p \leq .01$.

Table 2.

Descriptive Statistics for Raw Data and Standardized Effect Size Estimates from Multiple Imputation Datasets for Mean Differences for Primary and Secondary Outcomes for In-Home In-Person, Home-Based Telehealth, and Office-Based Telehealth

	In-Home, In-Person			Home-Based Telehealth			Office-Based Telehealth		
	Pre-Tx	Post-Tx	6-mo Post	Pre-Tx	Post-Tx	6-mo Post	Pre-Tx	Post-Tx	6-mo Post
	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>	<i>M</i>
	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)	(<i>SD</i>)
		<i>d^a</i>	<i>d</i>		<i>d</i>	<i>d</i>		<i>d</i>	<i>d</i>
CAPS-5	41.8	20.6	22.2	41.5	21.5	24.9	40.6	21.6	23.7
Severity	(6.50)	(12.86)	(12.56)	(7.93)	(14.77)	(14.20)	(8.32)	(15.10)	(14.14)
	n/a	1.08	0.96	n/a	1.02	0.85	n/a	0.96	0.84
PCL-5	54.7	27.8	32.1	53.4	20.1	32.4	53.1	31.6	33.3
	(9.82)	(19.3)	(18.32)	(10.48)	(21.34)	(20.20)	(11.57)	(22.21)	(19.67)
	n/a	0.62	0.54	n/a	0.45	0.41	n/a	0.38	0.35
BDI-II	31.7	16.4	17.1	30.7	17.2	18.9	29.7	20.9	20.6
	(9.58)	(12.34)	(11.84)	(10.47)	(14.87)	(14.37)	(9.31)	(13.53)	(12.86)
	n/a	0.52	0.48	n/a	0.39	0.28	n/a	0.19	0.18

Note. Means (*M*), standard deviations (*SD*), *d* = standardized mean differences in pre- to follow-up effect size estimates (small effect = .20, medium effect = .50, large effect = .80 per Cohen, 1988). ^a = *ds* were calculated using pooled means and standard errors from 100 multiple imputation analyses. Standard errors across conditions were converted to a pooled standard deviation in order to calculate standardized effect sizes. IHIP = In-home in-person; HBT = Home-based telehealth; OBT = Office-based telehealth. PTSD = posttraumatic stress disorder. DSM-5 = Diagnostic and Statistical Manual, Version 5. CAPS-5 = Clinician-Administered PTSD Scale for DSM-5. PCL-5 = PTSD Checklist for DSM-5. BDI-II = Beck Depression Inventory – II.

Table 3.

Odds ratios (OR) with 95% Confidence Intervals (CI) for Predictors of Premature Treatment Termination (Dropout) from Prolonged Exposure (PE) Treatment

Predictors	Odds Ratios (OR)	95% CI	p-value
IHIP vs OBT	5.08	[2.10, 12.26]	< .001
IHIP vs HBT	2.67	[1.10, 6.52]	.031
Navy vs Other Branches	1.24	[0.61, 2.51]	.553
Age Entered Service	1.14	[1.01, 1.28]	.036
Military Satisfaction	0.87	[0.62, 1.21]	.392
Pre-treatment CAPS-5	1.03	[0.97, 1.09]	.354
Pre-treatment BDI-II	1.01	[0.96, 1.07]	.761
Pre-treatment BAI	0.98	[0.95, 1.02]	.302
Pre-treatment B-IPF	1.02	[0.97, 1.07]	.473

Note. IHIP = In-home, in-person; HBT = Home-based telehealth; OBT = Office-based telehealth. OR = odds ratio. 95% CI = 95% confidence interval. PTSD = posttraumatic stress disorder. DSM-5 = Diagnostic and Statistical Manual, Version 5. CAPS-5 = Clinician-Administered PTSD Scale for DSM-5. BDI-II = Beck Depression Inventory – II. BAI = Beck Anxiety Inventory. B-IPF = Brief Inventory of Psychosocial Functioning.

Table 4.
Prolonged Exposure (PE) Treatment Information by Treatment Condition

Variable	Total <i>N</i> = 175 <i>n</i> (%)	IHIP <i>n</i> = 58 <i>n</i> (%)	HBT <i>n</i> = 58 <i>n</i> (%)	OBT <i>n</i> = 59 <i>n</i> (%)	Statistical Results
Completed treatment	109 (62.3%)	46 (79.3%)	36 (62.1%)	27 (45.8%)	$\chi^2(2) = 14.01^{***}$
Off-protocol (non-PE) sessions					$\chi^2(4) = 5.81$
None	164 (93.7%)	53 (91.4%)	57 (98.3%)	54 (91.5%)	
One session	9 (5.1%)	4 (6.9%)	0 (0%)	5 (8.5%)	
Two sessions	2 (1.1%)	1 (1.7%)	1 (1.7%)	0 (0%)	
Early Responders [±]	7 (4.0%)	2 (3.4%)	3 (5.2%)	2 (3.4%)	$\chi^2(2) = 0.31$
Current PTSD diagnosis at post-tx	74.8 ^a (42.7%)	26.0 (44.8%)	26.4 (45.5%)	22.3 (37.8%)	$\chi^2(2) < 6.01^b$
Current PTSD diagnosis at 6-mo post-tx	87.2 ^a (49.8%)	27.1 (46.7%)	29.6 (51.0%)	30.5 (51.7%)	$\chi^2(2) < 3.79^c$
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	
PE sessions	8.4 (4.95)	9.8 (5.00) ^d	8.3 (4.96)	7.0 (4.55) ^d	$F(2) = 4.95^{**}$

Note. IHIP = In Home, In Person treatment; HBT = Home-Based Telehealth; OBT = Office-Based Telehealth; PE = Prolonged Exposure Therapy. Post-tx = post-treatment. 6-mo post-tx = Follow up interview 6-mo post-treatment. ** = $p \leq .01$, *** = $p \leq .001$. ^a Sample sizes for current PTSD diagnoses are not whole numbers due to pooling of frequency data over 100 multiple imputation data sets. ^b Methods are not currently available to pool chi-square results over multiple imputation data

sets. One of the p -values was $p = .05$. The remaining 99 chi-square tests results in values with associated p -values $< .09$.^c Methods are not currently available to pool chi-square results over multiple imputation data sets. None of the p -values for the 100 data sets were smaller than $p = .15$.^d Values for the same variable that share the same superscript are significantly different from each with $p \leq .01$.[±] Early responders completed six or seven sessions of PE and had PCL-5 scores below 21 for two consecutive sessions.

Appendix B

What Do Veterans Want? Understanding Veterans' Preferences for PTSD Treatment Delivery

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Keywords: ehealth, telehealth, home telecare, telemedicine

Structured Summary

Introduction: Home-based delivery of psychotherapy may offer a viable alternative to traditional office-based treatment for posttraumatic stress disorder (PTSD) by overcoming several known barriers to care. Little is known about patient perceptions of home-based modalities of care for mental health.

Materials and Methods: Veterans diagnosed with PTSD ($N = 180$) completed a clinician-administered PTSD assessment and identified their modality preference for receiving prolonged exposure (PE) PTSD therapy: home-based telehealth (HBT), office-based telehealth (OBT), or in-home-in-person (IHIP). Descriptive statistics were used to examine veterans' first choice preference. Chi square tests were used to determine if there were significant differences between first choice preferences within our sample; additional tests were conducted to examine if age, sex, and MST history were associated with preferences.

Results: Overall, there was no clear preference stated for one treatment modality: 42% of veterans preferred HBT, 32% preferred IHIP, and 26% preferred OBT. We found an interaction between gender and age group on treatment preferences. Specifically, age group predicted treatment preferences among women ($\chi^2[2] = 7.18$, $p = .028$) but not among men ($\chi^2[2] = 1.83$, $p = .401$). Younger women (≤ 44 years) tended to prefer OBT (45%) over HBT (21%), while older women preferred HBT (56%) over OBT (13%). Preferences for IHIP were similar among older (31%) and younger (34%) women. MST history did not predict preferences.

Conclusions: Each modality was preferred by a substantial portion of participants. Fewer than 50% of the sample preferred one method to another, and each modality was preferred by at least a quarter of all participants, suggesting that one treatment modality does not fit all. Both homebased care options were well received by veterans, highlighting the value of offering a range of options for veterans to obtain care. The use of home-based care can expand access to care to veterans, particularly rural veterans. The current study is the first study to examine PTSD treatment delivery modality preferences and includes a diverse group of treatment-seeking PTSD veterans. The study did use a forced choice preference measure and did not examine the strength of preference, which limits the conclusions we can draw. Future studies should continue to understand the impact of veterans' treatment delivery modality preferences on treatment outcomes and engagement.

Introduction

Telemental health technology addresses several barriers to care among veterans with posttraumatic stress disorder (PTSD) who seek mental health care through the Veterans Health Administration.¹⁻³ Non-inferiority trials show that evidence-based PTSD treatments such as prolonged exposure (PE)⁴ and cognitive processing therapy⁵ delivered via office-based telehealth (OBT; i.e., videoconferencing between Veterans Health Administration [VHA] facilities) and home-based telehealth (HBT; i.e., videoconferencing between VHA facility and the patient's home) are no less efficacious than treatments delivered in-person, and offer a viable alternative to face-to-face care.⁶⁻⁸ Telemental health technology offers veterans with PTSD an option to receive care “where they're at”³ geographically and psychologically^{2,9} by overcoming practical barriers (e.g., long distances, travel times, childcare, work schedules) and agency-level barriers (e.g., shortage of specialists, limited after-hours availability).¹⁰ Increased access to care through the use of telehealth has increased the utilization and reach of mental health services among veterans with PTSD.¹¹

Understanding patient perceptions of technology-based alternatives is an important next step in determining the potential of telemental health in clinical practice. Studies evaluating treatment satisfaction among veterans receiving care through office-based telehealth⁶ and home-based telehealth^{6,12,13} report satisfaction levels comparable to office-based care. However, little is known about patient preference for either modality. Patient preference may influence retention, engagement, attendance, and clinical outcomes.¹⁴⁻¹⁷ A recent study found that individuals with PTSD who received a less preferred treatment type (PE vs. sertraline) were less likely to complete treatment.¹⁸ Among patients who received their preferred method of treatment, care

was more cost-effective in terms of cost per patient, utilization of services, and Quality Adjusted Life Years.¹⁴

The existing preferences literature is largely limited to treatment type and does not adequately address treatment delivery modality preferences. In a meta-analysis of PTSD patient preferences¹⁹ only one study examined patient preferences for technology-enhanced care²⁰; however, this study was limited to internet-based therapy (e.g., therapy delivered over the internet with and without clinician contact). Gutner and colleagues (2018)²¹ found that veterans seeking treatment for PTSD preferred in-person counseling over a self-help app or computer program. Whealin and colleagues (2015)²² assessed veteran's willingness to use telemental health platforms to receive their care (e.g., home-based and office-based videoconferencing, computer-based interventions) and found veterans with PTSD were less willing to use telemental health than veterans without PTSD. These studies add to a growing body of literature examining veterans' preferences and willingness to use technology-based delivery modalities; however, none of these studies have assessed veterans' preferences for in-home, in-person care – which may reduce barriers to care even more than telehealth-based platforms. Additional studies examining veterans' preferences for PTSD treatment delivery are critical as they can inform the treatment delivery options available to millions of veterans through the VA Health Care System.

No studies have examined preferences for delivery modality or factors that influence these preferences; however, research has established that both clinical (e.g., comorbidity, sexual trauma history) and demographic factors (e.g., gender) can influence treatment type preferences.^{19,23} These factors may also affect modality preferences. Studies with female veterans, including those with military sexual trauma (MST) history and combat exposure, have found that women view the Veterans Affairs (VA) hospitals as being “geared towards men,” a

difficult location to obtain women's health care, and less likely to have specialty care providers.^{24,25} Women veterans report problems with VA doctors, staff, and access to care.^{24,25} The women surveyed also report difficulties with logistics of receiving care (e.g., long wait, poor continuity of care).²⁵ The VA hospital may serve as a trauma reminder for both female and male MST survivors because other patients receiving services possess similar characteristics to their perpetrators.²⁶ Offering options to access treatment remotely could allow these women to circumvent these perceived barriers.

Age may also influence treatment modality preferences as younger individuals may be more willing to use and adopt telehealth compared to older individuals. A study examining the characteristics of adopters and non-adopters of electronic patient health records (EHR) found that older adults were less likely to adopt EHR. The authors suggested there may be a "digital divide" among younger and older healthcare consumers.²⁷ Studies have found older adults have less favorable attitudes towards telehealth compared to younger adults.^{28,29} However, one study found that there were no differences between older and younger individuals residing in rural regions.²⁸ This literature suggests that, in general, younger individuals may be more willing to utilize telehealth services for their healthcare, which may be because of greater familiarity and exposure to electronic technology throughout their lives.²⁹ Younger veterans may experience additional logistical barriers to care, such as work, school, and family obligations, which may make telehealth services more appealing.³⁰ More research is needed on how demographic factors influence perceptions of receiving care via technology.

The VA Healthcare System has invested significant resources into implementing telemental health, including HBT, for the delivery of mental health services. However, little is known about veterans' preferences for treatment modality. Better understanding veterans'

preferences will allow providers to offer care that is patient-centered and responsive to veterans' needs. The first aim of this study was to identify veterans' delivery-modality preferences for receiving PE delivered via OBT, HBT, or in-home, in-person (IHIP). The second aim was to examine individual factors associated with veteran preferences. Based on the previous literature we identified age, gender, and history of MST as potential factors.

Methods

Participants

In order to recruit veterans with PTSD who were willing to receive treatment via telehealth, providers at clinics across a large Veterans Affairs Hospital, including its Community Based Outpatient Clinics, were educated about the study and provided with fliers. Recruitment occurred at a variety of clinics, including the Family Mental Health Program (FMHP), the PTSD Clinic, Behavioral Health Interdisciplinary Programs, Mood Disorders Clinic, and the Primary Care Mental Health Clinic. Providers were able to refer veterans who expressed interest in study participation. Study staff also attended weekly PTSD Clinic orientations and briefly presented about the study to veterans; veterans who were interested in the study could provide their information to the study staff to be contacted. Participants were also able to self-refer, as study advertisements (e.g., fliers) were posted in multiple community and VA locations.

Eligibility criteria for the larger randomized clinical trial that this data is from included meeting Diagnostic and Statistical Manual-5 (DSM-5) criteria for PTSD, having a memory of the trauma, access to internet and telephone, and residence within a 35-mile radius of the main VA Hospital. Exclusion criteria included concurrent PTSD or exposure treatment, untreated substance abuse or dependence, medication non-compliance or abuse, psychiatric-hospitalization or incarceration (past year), dementia, unmanaged psychosis or mania, recent suicide attempt

(past year), registered sex offender status, and perpetration of recent sexual or physical assault (past 5 years). For this current study examining treatment preferences, veterans did not need to meet all of the inclusion criteria. Veterans were required to have treatment preferences data at baseline and have completed the baseline assessment for the study; therefore, this study is comprised of veterans who were eligible and ineligible for the larger trial to increase generalizability.

Of the 846 veterans who were referred to the study (self-referred or by a provider), 712 were assessed through the phone screening process. One hundred and ninety-nine veterans were assessed during a baseline interview; a convenience sample of 180 veterans (21% of those who were originally referred) were eligible for participation in this study and chose to participate in this study. The [removed for blind review] Institutional Review Board (IRB) approved all procedures. Data were collected from January 2014 to October 2017.

Study Procedures and Design

Interested participants completed a phone-screen, followed by an in-person baseline assessment. All data were collected during the baseline assessment for a non-inferiority randomized clinical trial evaluating three delivery modalities for PE.⁴ Eligible and interested participants were randomized to OBT, HBT, or IHIP.

Measures

Treatment Delivery Modality Preferences. The study investigators developed a treatment delivery modality questionnaire to evaluate veterans' preferences for receiving PE prior to randomization. The questionnaire included a brief summary of each modality and instructions to rank first, second, and third choice (i.e., OBT, HBT, IHIP). Veterans were not guaranteed to receive their top choice modality because veterans were randomized to each of the

modalities. Each veteran's first choice for modality was used for categorization in analyses; OBT was included as the referent condition because it is now commonly offered within the VHA to provide PTSD evidence-based treatments, is non-inferior to traditional office-based care,^{7,8} and is the only option for veterans to receive psychotherapy in many rural VA Community Based Outpatient Clinics (CBOCs). Note also that OBT and traditional office-based care share similar barriers (e.g., driving time, difficulty parking, confronting military reminders, sitting in crowded waiting rooms).

Demographics. Veterans also completed a demographics questionnaire that included information about age, sex, race/ethnicity, marital status, income, and military service branch.

Data Analysis

Statistical analyses were performed using IBM Statistical Package for the Social Sciences (SPSS) for Windows, Version 24. Descriptive statistics examined demographic variables and veterans' first-choice delivery-modality preference. A chi-square test was conducted to determine if there were significant differences among first-choice preferences within our sample, and one-sample binomial tests were used to compare each pair of treatment options with the test proportions set as being equal between conditions (50% each).

Next, multinomial regression was used to examine if veteran characteristics were associated with treatment preferences, using OBT as the comparator. Three predictors were included in the model: (1) sex (male = 0, female = 1), (2) MST history (negative = 0, positive = 1), and (3) age group (45 years and older = 1 and 44 years old and younger = 0). Finally, each model included the Gender x Age Group interaction and the main effects for the three predictors. The MST history by age group interaction term was not included in the models due to the severe uneven distribution of MST histories between sexes, which resulted in several very small cell

sizes. Eighty-seven percent of women screened positive for MST, while 10% of men screened positive for MST. Because of the overall smaller number of women in the study ($n = 45$), we conducted separate multinomial regressions by sex, comparing the effects of MST history and age group on the primary choice of treatment condition, using OBT as the comparator.

Results

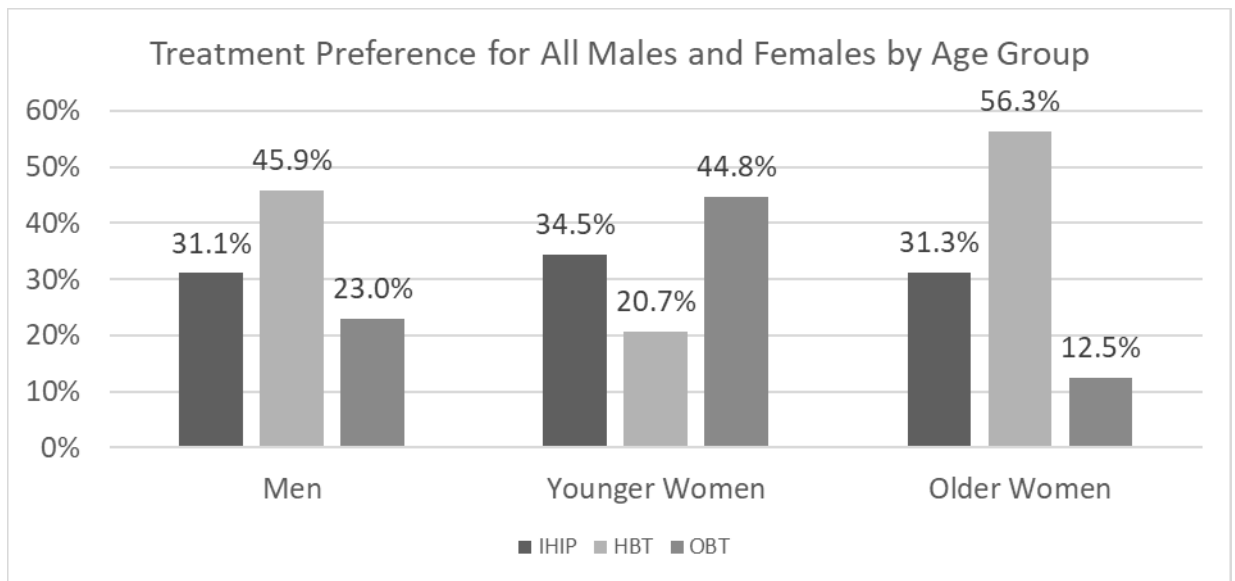
The ages of the 180 participating veterans ranged from 23 to 89 ($M = 46.30$, $SD = 13.92$). Seventy-five percent of the participants were male ($n = 135$) and 25% were female ($n = 45$). The majority of participants were married (54%). The largest racial group was Caucasian (46%), with the remainder self-identifying as African-American (28%), Asian-American (9%), American Indian or Alaskan Native (3%), Native Hawaiian or Pacific Islander (3%), or other (11%). All military branches were represented in the sample (Army [30%], Marines [28%], Navy [49%], Air Force [6%], Coast Guard [0.6%]); veterans could endorse more than one military branch of service. The median income was between \$30,001 and \$45,000. Twenty-nine percent of participants reported MST (87% of females, 10% of males); 36% of female participants and 56% of male participants were aged 45 or older. See Table 1 for additional demographic information.

A one-sample chi-square test indicated there were differences in rates of preference among the 180 participants ($X^2[2] = 8.23$, $p = .01$). However, no treatment received a clear majority preference in the sample, with 77 (42.8%) of veterans choosing HBT, 57 (31.7%) choosing IHIP, and 46 (25.6%) choosing OBT (see Figure 1). In pairwise comparisons, HBT was significantly preferred over OBT ($p = .01$). The differences between IHIP and OBT, as well as between IHIP and HBT, were not statistically significant ($p = .32$, $p = .10$, respectively).

Next, multinomial regression was used to test the impact of veteran characteristics on treatment preferences. None of the veteran characteristics predicted differences in veterans'

preferences for IHIP compared to OBT, (all $ps > .199$). However, age group significantly predicted veterans' preferences for HBT compared to OBT, odds ratio (OR) = 10.02, 95% CI (1.63, 61.76). Veterans in the older group were significantly more likely to request HBT compared to OBT, odds ratio (OR) = 10.02, 95% CI = (1.63, 61.76).

Because of the small sample of women, we conducted additional multinomial regression analyses for each sex separately. Among the men, neither of age group nor MST history predicted differences in veterans' preferences of IHIP or HBT compared to OBT (all $ps > .207$). Among the women, a main effect for age group was found with female Veterans in the older age group being significantly more likely to request HBT over OBT compared to younger women veteran, odds ratio (OR) = 10.66, 95% confidence interval (CI) = (1.68, 67.58), $p = .012$ (see Figure 1). The large OR and wide CI most likely are due to imprecision in the estimates due to the small sample size of women. Finally, there were no differences in treatment preferences for IHIP compared to OBT among women based on age group or MST history. Figure 1 depicts treatment preference rates for each condition for three groups: (1) males, (2) younger female age group, and (3) older female age group.



Discussion

A substantial number of veterans expressed interest in receiving PE via each of the delivery modalities, suggesting that veterans seeking care for PTSD could benefit from having a range of options for accessing care. When examined as a group, veterans (except women over 45 years old) preferred HBT to OBT, suggesting an openness to utilizing technology at home. This finding gives merit to the expansion of telehealth services, which have already been successful in expanding the reach of specialty mental health services by connecting providers at urban VA medical centers with underserved CBOCs.³¹ Additionally, there is preliminary research that suggests HBT is non-inferior to traditional office-based care,⁶ and may be more cost-effective than IHIP while still increasing access to care, reducing stigma, and overcoming logistical and environmental barriers.^{26,32}

One-third of veterans preferred IHIP care, and just under half (43%) preferred HBT, suggesting that veterans are open to receiving care in their homes, either in-person or through telehealth. Providers and VA mental health clinics should consider offering home-based services to veterans to accommodate preferences, because matching patients with their preferred method for receiving care could result in greater retention, engagement, clinical outcomes, and cost-effectiveness.^{14,33}

Our findings indicate that veterans may be more willing to receive care via telehealth in comparison to Gutner et al (2018) and Whealin et al. (2015) findings.^{21,22} However, this difference may be due to the fact that each of our three studies required veterans to pick from a small selection of options, and there was little overlap in the choices presented among studies. In general, this highlights the need for more targeted research in this area.

There were few differences in preference with regard to demographic variables, however we did find that among women, age influenced treatment preferences. Specifically, women aged 45 and older were more likely to request HBT while younger women were more likely to request OBT. Irrespective of age, men seemed to prefer the convenience of home-based telehealth. In contrast, women's treatment preferences were influenced by their age group, though both groups preferred telehealth services over in-person, in-home treatment. There may be unique barriers to veterans utilizing in-person, in-home treatment. Veterans may have concerns about a therapist coming into their home, including privacy concerns, worries about the presentation and appearance of their home, or difficulties trusting providers to be in their home particularly earlier in therapy. Younger women reported a slight preference for OBT services while older women preferred HBT. These findings emphasize the overall preference for telehealth care in our sample compared to IHIP, regardless of gender. However, the effects of age on modality preference among women may reflect barriers to in-office care that uniquely affect the middle-aged and older female populations (e.g., responsibility for caring for both older and younger family members, which may make it more difficult to attend office-based appointments). Also, this finding may reflect that older women have a history of receiving care at a more male-oriented VA environment, whereas younger women may be more comfortable receiving care at modern VA hospitals, which have increased outreach to female veterans and expanded women's services. Younger women may be more likely to have young children in the home, which may require active caregiving during treatment sessions if women have difficulty obtaining childcare. Therefore, OBT may offer a neutral setting where younger women can receive more private care with fewer distractions.

Our hypothesis that MST survivors would prefer obtaining care outside of the VA was not supported. There were no differences in treatment preference among those with a history of MST and those without. This finding suggests that MST survivors may be amenable to receiving PTSD treatment in multiple settings, which could improve access to care and wait times.

There are several important study limitations worth noting. We did not have a traditional office-based standard of care reference arm for comparison, so participants may have viewed each of the modalities as a completely novel approach to care. The lack of a traditional office-based control arm also limits our ability to draw conclusions about veterans' preferences in comparison to traditional care. Additionally, veterans were forced to choose between three delivery modalities, so they may have preferences for other approaches, preferred the ability to alternate between modalities during a course of therapy, or had no preference between offered modalities (but were forced to choose one). The current study did not assess the strength of preference; prior studies within the depression literature have found that the strength of preference is associated with quicker improvement in therapy and more predictive of outcome than treatment preference congruence.³⁴ Although the current study did not examine the relationship between preference and outcome, understanding the strengths of veteran preferences could inform which services are offered to veterans. Our study also did not ask veterans to explain the reasons for their preferences; qualitative interviews would elucidate veterans' rationale for their treatment preferences. Due to our recruitment and inclusion criteria, our sample was treatment-seeking, may have had above average exposure to and confidence with technology, and may not be representative of the full spectrum of veterans (e.g., individuals with substance use disorder, imminent suicidality); thus, it may not be representative of all veterans with PTSD. Our sample was one of convenience (i.e., comprised of veterans who were already

seeking care at the VA or similar clinics) and largely recruited from a single VA Health Care System in a location that predominantly serves Navy veterans; findings may not be generalizable to all veterans. Therefore, our findings may not be applicable to veterans seeking services outside of the VA Health Care System or non-treatment seeking veterans with PTSD. Finally, given the small sample size for some of the analyses, the findings should be considered preliminary.

Despite these limitations, the current study has several strengths. This manuscript is unique in its examination of veterans' preferences for PTSD treatment delivery modalities, and to evaluate preferences for HBT and in-person care. Furthermore, we obtained data from both male and female veterans of different war eras and branches, and with different trauma types, strengthening the generalizability of our findings. Additionally, although veterans with imminent suicidality were excluded for safety reasons, 30% of the sample endorsed suicidal ideation and veterans were on average severely depressed according to Beck Depression Inventory-II (BDI-II) severity cutoffs. The aforementioned demographic and clinical characteristics of this sample may attenuate concerns about the generalizability of our sample. One potential drawback to home-based care is the possibility of accommodating avoidance and undermining treatment outcomes; however, evidence suggests that home-based care does effectively treat PTSD.⁶ Future research should evaluate the influence of avoidance in treatment preference and find ways to balance logistical and clinical need-driven preferences with treatment goals. Although not assessed in the current study, future research should examine if veterans have preferences for their therapist, such as therapist gender, and if these preferences interact with trauma type. For example, MST survivors whose perpetrator was a male may prefer a female therapist. Researchers should ask veterans to rate the strength of their preference and examine whether preference strength or matching veterans with their preferred delivery modality improves therapy engagement and

outcomes. Although not investigated here, that range of options perhaps should also include the opportunity to switch between modality types as patient preferences and confronted obstacles shift over time. The current study only examined a few variables that could impact veterans' preferences for delivery modality. There is a need for additional variables to be studied, including the number of children in the home, practical barriers (e.g., difficulty with transportation), and technological literacy and comfort. Studies could also utilize qualitative data or mixed methods to better understand the reasons for veterans' preferences. These lines of research will enable the VA Healthcare System to optimize patient-centered care.

The current findings suggest that “one size does not fit all” for PTSD service delivery. Providers may consider offering evidence-based PTSD services through a variety of delivery modalities (e.g., home-based, telehealth) and working collaboratively with the veteran to determine the best option. Asking veterans about their preferences also provides an opportunity to correct any misconceptions about available service delivery modalities. Emerging shared decision-making research indicates that veterans with PTSD want to be actively involved in decisions about their treatment.³⁵ Providers may consider using shared decision-making tools during intakes or clinic orientations to help guide the treatment planning process for both treatment type and delivery modality (e.g., home-based, telehealth, or face-to-face). Expanding treatment delivery options through a patient-centered and flexible approach may increase veterans' willingness to seek and remain in therapy.

References

1. Fortney JC, Burgess JF, Bosworth HB, et al. A re-conceptualization of access for 21st century healthcare. *J Gen Intern Med.* 2011;26(suppl 2):639-647. doi:10.1007/s11606-011-1806-6
2. Hoge CW. Interventions for war-related posttraumatic stress disorder: meeting veterans where they are. *JAMA.* 2011;306(5):549-551. doi:10.1001/jama.2011.1096
3. Shore P, Goranson A, Ward MF, et al. Meeting veterans where they're @: a VA home-based telemental health (HBTMH) pilot program. *Int J Psychiatry Med.* 2014;48(1):5-17. doi:10.2190/PM.48.1.b
4. Foa EB, Hembree EA, Rothbaum BO. *Prolonged Exposure Therapy for PTSD: Emotional Processing of Traumatic Experiences Therapist Guide.* New York, NY: Oxford University Press; 2007.
5. Resick PA, Monson CM, Chard KM. *Cognitive Processing Therapy for PTSD: A Comprehensive Manual.* New York, NY: Guilford Press; 2016.
6. Acierno R, Knapp RG, Tuerk PW, et al. A non-inferiority trial of prolonged exposure for posttraumatic stress disorder: in person versus home-based telehealth. *Behav Res Ther.* 2017;89:57-65. doi:10.1016/j.brat.2016.11.009
7. Morland LA, Mackintosh MA, Greene CJ, et al. Cognitive processing therapy for posttraumatic stress disorder delivered to rural veterans via telemental health: a randomized noninferiority clinical trial. *J Clin Psychiatry.* 2014;75(5):470-476. doi:10.4088/JCP.13m08842
8. Morland LA, Mackintosh MA, Rosen CS, et al. Telemedicine versus in-person delivery of cognitive processing therapy for women with posttraumatic stress disorder: a

randomized noninferiority trial. *Depress Anxiety*. 2015;32(11):811-820.

doi:10.1002/da.22397

9. Kazdin AE. Evidence-based treatment and practice: new opportunities to bridge clinical research and practice, enhance knowledge base, and improve patient care. *Am Psychol*. 2008;63(3):146-159. doi:10.1037/0003-066X.63.3.146
10. Hundt NE, Helm A, Smith TL, et al. Failure to engage: a qualitative study of veterans who decline evidence-based psychotherapies for PTSD. *Psychol Serv*. 2017, advance online publication. doi:10.1037/ser0000212
11. Elliott VL. Telehealth and telemedicine: description and issues. *Analyst in health policy* (CRS Report No. R44437). 2016. Retrieved from:
<https://www.senate.gov/CRSpubs/757e3b90-ff10-497c-8e8c-ac1bdbb3aaf.pdf>
12. Yuen EK, Gros DF, Price M, et al. Randomized controlled trial of home-based telehealth versus in-person prolonged exposure for combat-related PTSD in veterans: preliminary results. *J Clin Psychol*. 2015;71(6):500-512. doi:10.1002/jclp.22168
13. Gros DF, Lancaster CL, López CM, et al. Treatment satisfaction of home-based telehealth versus in-person delivery of prolonged exposure for combat-related PTSD in veterans. *J Telemed Telecare*. 2018;24(1):51-55. doi:10.1177/1357633x16671096
14. Le QA, Doctor JN, Zoellner LA, et al. Cost-effectiveness of prolonged exposure therapy versus pharmacotherapy and treatment choice in posttraumatic stress disorder (the optimizing PTSD treatment trial): a doubly randomized preference trial. *J Clin Psychiatry*. 2014;75(3):222-230. doi:10.4088/JCP.13m08719

15. Mott JM, Stanley MA, Street RL Jr, et al. Increasing engagement in evidence-based PTSD treatment through shared decision-making: a pilot study. *Mil Med.* 2014;179(2):143-149. doi:10.7205/milmed-d-13-00363
16. Swift JK, Callahan JL. The impact of client treatment preferences on outcome: a meta-analysis. *J Clin Psychol.* 2009;65(4):368-381. doi:10.1002/jclp.20553
17. Watts BV, Schnurr PP, Zayed M, et al. A randomized controlled clinical trial of a patient decision aid for posttraumatic stress disorder. *Psychiatr Serv.* 2015;66(2):149-154. doi:10.1176/appi.ps.201400062
18. Feeny N. *Predicting dropout from PTSD treatment: prolonged exposure and sertraline.* Paper presented at: Anxiety and Depression Association of American Annual Meeting; 2017; San Francisco, CA.
19. Simiola V, Neilson EC, Thompson R, et al. Preferences for trauma treatment: a systematic review of the empirical literature. *Psychol Trauma.* 2015;7(6):516-524. doi:10.1037/tra0000038
20. Spence J, Titov N, Solley K, et al. Characteristics and treatment preferences of people with symptoms of posttraumatic stress disorder: an internet survey. *PLoS One.* 2011;6(7):e21864. doi:10.1371/journal.pone.0021864
21. Gutner CA, Pederson ER, Drummond SP. Going direct to the consumer: Examining treatment preferences for veterans with insomnia, PTSD, and depression. *Psychiatry Res.* 2018;263:108-114. doi:10.1016/j.psychres.2018.02.045
22. Whealin JM, Seibert-Hatalsky LA, Willett Howell J, Tsai J. E-mental health preferences of Veterans with and without probable posttraumatic stress disorder. *J Rehabil Res Dev.* 2015;52(6):725-738. doi: 10.1682/JRRD.2014.04.0113

23. Roy-Byrne P, Berliner L, Russo J, et al. Treatment preferences and determinants in victims of sexual and physical assault. *J Nerv Ment Dis.* 2003;191(3):161-165.
doi:10.1097/01.NMD.0000055343.62310.73
24. Kelly MM, Vogt DS, Scheiderer EM, et al. Effects of military trauma exposure on women veterans' use and perceptions of Veterans Health Administration care. *J Gen Intern Med.* 2008;23(6):741-747. doi:10.1007/s11606-008-0589-x
25. Vogt D, Bergeron A, Salgado D, et al. Barriers to Veterans Health Administration care in a nationally representative sample of women veterans. *J Gen Intern Med.* 2006;21(suppl 3):S19-S25. doi:10.1111/j.1525-1497.2006.00370.x
26. Gilmore AK, Davis MT, Grubaugh A, et al. "Do you expect me to receive PTSD care in a setting where most of the other patients remind me of the perpetrator?": home-based telemedicine to address barriers to care unique to military sexual trauma and veterans affairs hospitals. *Contemp Clin Trials.* 2016;48:59-64. doi:10.1016/j.cct.2016.03.004
27. Yamin CK, Emani S, Williams DH, et al. The digital divide in adoption and use of a personal health record. *Arch Intern Med.* 2011;171(6):568-574.
doi:10.1001/archinternmed.2011.34
28. Grubaugh AL, Cain GD, Elhai JD, et al. Attitudes toward medical and mental health care delivered via telehealth applications among rural and urban primary care patients. *J Nerv Ment Dis.* 2008;196(2):166-170. doi:10.1097/NMD.0b013e318162aa2d
29. Rohland BM, Saleh SS, Rohrer JE, et al. Acceptability of telepsychiatry to a rural population. *Psychiatr Serv.* 2000;51(5):672-674. doi:10.1176/appi.ps.51.5.672

30. Ouimette P, Vogt D, Wade M, et al. Perceived barriers to care among veterans health administration patients with posttraumatic stress disorder. *Psychol Serv.* 2011;8(3):212-223. doi:10.1037/a0024360
31. Deen, TL, Godleski, L, Fortney, JC. A description of telemental health services provided by the Veterans Health Administration in 2006–2010. *Psych Services.* 2012;63(2):1131-1133. doi:10.1176/appi.ps.201100458
32. Zinzow HM, Britt TW, McFadden AC, et al. Connecting active duty and returning veterans to mental health treatment: interventions and treatment adaptations that may reduce barriers to care. *Clin Psychol Rev.* 2012;32(8):741-753.
doi:10.1016/j.cpr.2012.09.002
33. Feeny NC, Zoellner LA, Mavissakalian MR, et al. What would you choose? Sertraline or prolonged exposure in community and PTSD treatment seeking women. *Depress Anxiety.* 2009;26(8):724-731. doi:10.1002/da.20588
34. Lin P, Campbell DG, Duncan G, et al. The influence of patient preference on depression treatment in primary care. *Ann Behav Med.* 2005;30(2):164-173.
doi:10.1207/s15324796abm3002_9
35. Harik JM, Hundt NE, Bernardy NC, et al. Desired involvement in treatment decisions among adults with PTSD symptoms. *J Trauma Stress.* 2016;29(3):221-228.
doi:10.1002/jts.22102