Cognitive Processing Therapy for Posttraumatic Stress Disorder Delivered to Rural Veterans via Telemental Health: A Randomized Noninferiority Clinical Trial

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ABSTRACT

Objective: To compare clinical and process outcomes of cognitive processing therapy-cognitive only version (CPT-C) delivered via videoteleconferencing (VTC) to in-person in a rural, ethnically diverse sample of veterans with posttraumatic stress disorder (PTSD).

Method: A randomized clinical trial with a noninferiority design was used to determine if providing CPT-C via VTC is effective and "as good as" in-person delivery. The study took place between March 2009 and June 2013. PTSD was diagnosed per *DSM-IV*. Participants received 12 sessions of CPT-C via VTC (n = 61) or in-person (n = 64). Assessments were administered at baseline, midtreatment, immediately posttreatment, and 3 and 6 months posttreatment. The primary clinical outcome was posttreatment PTSD severity, as measured by the Clinician-Administered PTSD Scale.

Results: Clinical and process outcomes found VTC to be noninferior to in-person treatment. Significant reductions in PTSD symptoms were identified at posttreatment (Cohen $d = 0.78$, $P < .05$) and maintained at 3- and 6-month follow-up ($d = 0.73$, $P < .05$ and $d = 0.76$, $P < .05$, respectively). High levels of therapeutic alliance, treatment compliance, and satisfaction and moderate levels of treatment expectancies were reported, with no differences between groups (for all comparisons, $F < 1.9$, $P > .17$).

Conclusions: Providing CPT-C to rural residents with PTSD via VTC produced outcomes that were "as good as" in-person treatment. All participants demonstrated significant reductions in PTSD symptoms posttreatment and at follow-up. Results indicate that VTC can offer increased access to specialty mental health care for residents of rural or remote areas.

Trial Registration: ClinicalTrials.gov identifier: NCT00879255

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Posttraumatic stress disorder (PTSD) is a costly and debilitating disorder that is associated with an elevated risk for a host of problems, including suicide,[1] substance use,[2] and anger problems.[3] The prevalence is estimated to be 6% in the US population,[4] with increased rates in military populations, including 9%–15% of Vietnam veterans[5] and 10%–20% of veterans of the wars in Iraq and Afghanistan.[6] Despite the urgent need for care and the availability of effective treatments, mental health services for veterans are characterized by high rates of underutilization and attrition. Among veterans in need of PTSD services, 50%–90% attend an insufficient number of visits or do not initiate them at all.[7,8] Furthermore, veterans who do initiate PTSD treatment demonstrate high rates of treatment dropout, ranging from 20% to 40% in clinical trials.[9] Factors associated with treatment nonengagement or dropout include PTSD symptomatology (avoidance), fear of stigmatization, and logistical problems (transportation, scheduling, child care).[10] These barriers are compounded for rural residents, whose access to evidence-based mental health care for PTSD is typically limited,[11,12] in part due to lack of treatment providers.[13] This disparity is particularly concerning given that 40% of US veterans live in rural areas.[11]

Technological innovations, such as videoteleconferencing (VTC), can help address many of the clinical and logistical impediments to accessing care for underserved rural populations.[12] The delivery of services via VTC involves use of telecommunications equipment so that a clinician in one location can provide treatment to patients in another. VTC offers a number of advantages over traditional treatment approaches,[14,15] as VTC patients benefit in terms of decreased transportation costs, travel time, and missed work[16] and enhanced access to treatment for veterans with serious injuries or scheduling difficulties due to work, school, or childcare responsibilities.

Studies of psychotherapy delivered via VTC have shown high degrees of patient and clinician satisfaction[17] and outcomes comparable to in-person delivery with regard to rates of attendance[18] and information retention.[19] VTC is an effective delivery modality for non–trauma-focused interventions for veterans with PTSD.[19–21] Preliminary evidence supports the effectiveness of VTC delivery of PTSD care with veterans.[22,23] However, questions remain about the feasibility of using VTC to deliver trauma-focused interventions, which directly assess a particular traumatic event and the subsequent thoughts or behaviors associated with that event, because patients with PTSD are often reluctant to engage in such therapies due to avoidance. Thus, the next step in assessing the feasibility and safety of VTC as a delivery modality is a rigorous evaluation of whether trauma-focused treatments delivered by VTC produce comparable outcomes to in-person delivery.

One efficacious treatment for PTSD is cognitive processing therapy (CPT).[24] CPT is a trauma-focused psychotherapy that can be delivered in

Clinical Points

- Use of clinical videoteleconferencing services to provide evidence-based treatment to veterans with posttraumatic stress disorder (PTSD) was found to be as effective as face-to-face treatment provision without negatively impacting therapeutic process measures.
- Group-based cognitive processing therapy for veterans with PTSD demonstrated statistically and clinically meaningful reductions in PTSD symptoms over time among a sample of rural veterans, many with chronic PTSD.
- Clinical videoteleconferencing modality serves as an effective method to increase access to evidence-based care among rural veterans.

individual or group formats and is effective in treating PTSD in civilians and veterans.[25,26] CPT is a cognitive behavioral therapy that targets cognitive symptoms of PTSD, and CPT-cognitive only (CPT-C) is a variant of CPT that excludes the written trauma narrative. CPT includes a psychoeducation component, a series of skill building exercises, and practice strategies to restructure thoughts. Problematic beliefs and cognitions are identified and addressed. Group delivery of CPT-C addresses 2 of the major barriers to acquisition of mental health care for PTSD: patient avoidance and limited clinician time. CPT-C is as effective as original CPT.[27–29] Findings from an open trial with civilians and an early pilot cohort of this study with veterans further support the feasibility and safety of VTC delivery of CPT.[12,30]

The current study is the first randomized controlled trial (RCT) comparing the efficacy of delivering manualized CPT-C via VTC to in-person delivery in a sample of rural veterans with PTSD. Another study aim was to contribute to existing research that supports the clinical effectiveness of CPT-C. A noninferiority design was used to evaluate whether VTC psychotherapy was "as good as" in-person delivery at reducing PTSD symptoms. Further, we hypothesized that key process indicators would not be significantly different between conditions.

METHOD

Study Design and Participants

A noninferiority-designed RCT was conducted with male combat veterans with PTSD to compare the clinical effectiveness of CPT-C provided via office-based VTC to the in-person modality. Recruitment, treatment, and follow-up assessments took place between March 2009 and June 2013. The VA Pacific Island Health Care System's Institutional Review Board (IRB) approved the protocol. All participants provided written informed consent prior to study enrollment. The study was registered as a clinical trial with the ClinicalTrials.gov identifier of NCT00879255.

Inclusion criteria were as follows: (1) a diagnosis of current PTSD, determined by the Clinician-Administered PTSD Scale (CAPS),[31] was required, and (2) participants taking psychotropic medication were required to be on a stable medication regimen for a minimum of 45 days prior to study entry. Exclusion criteria were active psychotic symptoms/disorder, active homicidal or suicidal ideation, significant cognitive impairment or history of organic mental disorder, current substance dependence, and unwillingness to refrain from substance abuse during treatment. Female veterans were not included due to their limited number in the study clinical sites.

Recruitment and Randomization

Participants were recruited at 4 Veterans Affairs (VA) clinical sites and 3 Vet Centers across the Hawaiian islands of Hawaii, Maui, and Oahu. Following completion of initial assessment and informed consent procedures, participants were stratified by war era and randomly assigned through block randomization to one of two treatment modalities by an independent off-site clinician. Of the 125 participants in the intent-to-treat (ITT) sample (in-person = 64 and VTC = 61), 96 participants (in-person = 50 and VTC = 46) attended at least 10 of the 12 group treatment sessions, which occurred twice weekly over a 6-week period, and were therefore included in the completer sample.

Measures

Participants were assessed at baseline, midtreatment, immediately posttreatment, and 3 and 6 months posttreatment. At baseline, a structured clinical interview assessed demographic and health information, and the Structured Clinical Interview for *DSM-IV*[32] was used to evaluate exclusionary diagnoses and comorbidities. PTSD was diagnosed per the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (*DSM-IV*) criteria. The primary clinical outcome was PTSD severity, which was assessed with the CAPS at baseline and all follow-up assessments. We used the "1/2 rule" symptom rule on the CAPS, which stipulates that for a specific symptom to meet diagnostic threshold it must have a minimum frequency of 1–2 times in the past month and at least a moderate intensity.[33,34] All assessments were conducted in person by a master's- or doctoral-level assessor not involved with delivering the treatment and blind to condition assignment and occurred at the same VA clinic where the veteran attended treatment sessions.

Process variables included attrition, treatment adherence (session attendance and homework completion), patient satisfaction, treatment expectancy, and group therapeutic alliance. Homework completion was assessed according to whether or not a participant turned in completed between-session practice forms; quality of work was not assessed. Satisfaction with services was assessed posttreatment in both conditions using the Charleston Psychiatric Outpatient Satisfaction Scale-VA,[35] a 16-item measure adapted to evaluate satisfaction among veterans treated within VA clinics, and in the VTC condition using the Telemedicine Satisfaction and Acceptance Scale,[36] an 11-item measure assessing participants' experiences and comfort using a digital communication medium to receive treatment. Participants'

Table 1. Participant Demographic Characteristics and Comorbid Psychiatric Diagnoses[a]

Characteristic	Total Sample (N = 125)[b]	In-Person Group (n = 64)	VTC Group (n = 61)	P[c]
Age, mean (SD), y	55.3 (12.5)	54.6 (13.2)	56.1 (11.8)	.51
Self-reported primary ethnicity[d]				.28
Asian	19 (15.2)	9 (14.1)	10 (16.4)	
Caucasian	58 (46.4)	34 (53.1)	24 (39.3)	
Pacific Islander	17 (13.6)	10 (15.6)	7 (11.5)	
Other[e]	20 (16.0)	7 (10.9)	13 (21.3)	
Married	74 (59.2)	40 (62.5)	34 (55.7)	.70
War era				.56[f]
Vietnam[g]	83 (66.4)	42 (65.6)	41 (67.2)	
Other[h]	48 (38.4)	23 (35.9)	25 (41.0)	
Comorbid psychiatric diagnoses				
Current	65 (52.0)	32 (50.0)	33 (54.1)	.70
Major depressive disorder	36 (28.8)	16 (25.0)	20 (32.8)	.32
Anxiety disorder	24 (19.2)	12 (18.8)	12 (19.7)	.93
Substance use disorder	22 (17.6)	12 (18.8)	10 (16.7)	.70
Lifetime	115 (92.0)	60 (93.8)	55 (90.2)	.23
Major depressive disorder	80 (64.0)	41 (64.1)	39 (63.9)	.90
Anxiety disorder	28 (22.4)	15 (23.4)	13 (21.3)	.74
Substance use disorder	96 (76.8)	47 (73.4)	49 (80.3)	.65

[a]Values expressed as n (%) unless otherwise noted.
[b]The total intent-to-treat sample (N = 125) was used.
[c]Differences between conditions for demographic and other baseline characteristics (*P* values) were assessed using χ^2 tests of independence for categorical or ordinal variables and Student *t* tests for interval variables.
[d]Percentages do not add up to 100% because 8 participants reported more than 1 primary ethnicity and 3 men declined to state ethnicity. Participants could respond with up to 3 ethnicities; 40 of 122 endorsed multiple ethnicities.
[e]Includes Hispanic, Black, and Native American.
[f]Because some veterans served during the Vietnam War era and another war era, to maintain independence of observation in order to perform the χ^2 test, we compared veterans who served in the Vietnam War era only compared to those in who served in all other wars, which included 6 veterans who had also served in the Vietnam War era.
[g]Percentages add to greater than 100% because some veterans served in multiple war eras.
[h]Other war eras included Korean War, Desert Storm/Desert Shield, Operation Iraqi Freedom/Operation Enduring Freedom, and post-Vietnam to Desert Storm/Desert Shield.
Abbreviations: PTSD = posttraumatic stress disorder, VTC = videoteleconferencing.

beliefs about treatment credibility and expected outcomes were assessed at session 2 using the 4-item Treatment Expectancy Questionnaire.[37] Therapeutic alliance was assessed posttreatment using an abbreviated 30-item version of the Group Therapy Alliance Scale.[38] The therapists' attitudes toward the treatment were not assessed.

Treatment

Participants received the manualized group CPT-C protocol[28] in twelve 90-minute, twice-weekly sessions that took place over a 6-week period at their local VA clinic or Vet Center. They also received a CPT-C workbook, which included didactic information and homework assignments. Nine doctoral-level therapists and 1 social worker, all with prior experience conducting group CPT-C with veterans, provided group treatment in pairs consisting of a therapist and cotherapist. Within each cohort, the same therapists delivered both the experimental and control interventions. Therapists traveled from Honolulu to the clinical sites for the in-person condition and remained at the Honolulu VA for the VTC condition. The VTC services were delivered via Tandberg 880 Model Health Care System (Tandberg; New York, New York) VTC equipment. The VA IRB required a study observer, who was a research assistant with minimal clinical experience, to sit in the back of the room during the remote VTC sessions and remain silent except for intervening in cases of technological difficulties or clinical emergencies. The monetary costs and limited room size made including an observer inappropriate for the in-person delivery groups. Technical problems with VTC equipment or transmission were systematically tracked using a standardized form completed by the in-session observer, which tracked frequency and quality of technical difficulties and impact on the treatment session. In 156 group sessions, the observer intervened clinically on only 1 occasion, to address minor situational distress.

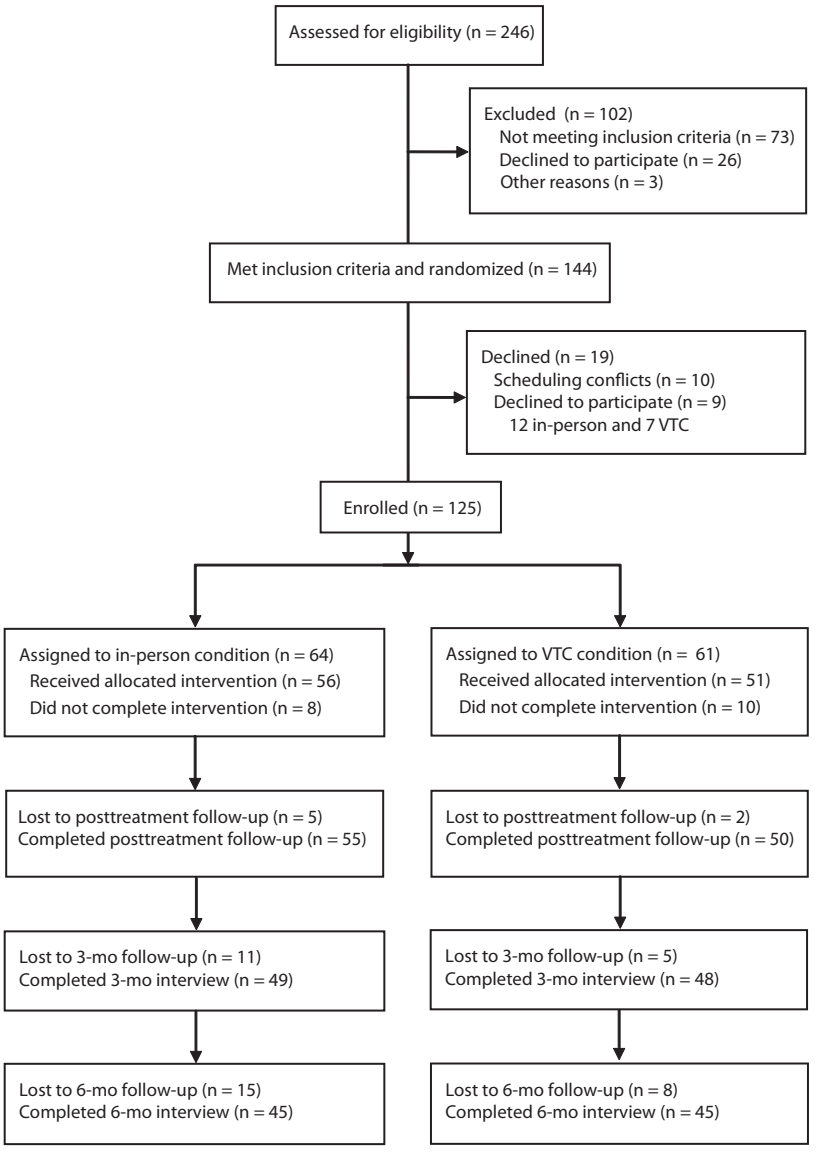
All sessions were audiotaped and reviewed weekly by the treatment supervisor to monitor competence and adherence to treatment protocol. A random 20% of sessions were independently reviewed by 2 experienced CPT practitioners using a standardized rating system specific to the CPT-C group protocol.[39] Excellent fidelity was found (therapists addressed 98.7% of 523 elements rated over 65 sessions; interrater reliability, as measured by κ, was 0.97). Competency ratings were high, with a mean rating of 4.6 out of 5 possible on 431 elements rated (interrater agreement, as measured by an intraclass correlation, was 0.61). There were no differences in adherence or competency ratings between treatment conditions or primary therapists.

Statistical Analyses

We used a noninferiority design to evaluate the impact of delivery modality on PTSD symptoms, which tests the hypothesis that VTC is noninferior to in-person delivery. The noninferiority margin is the maximum clinically meaningful amount by which VTC can be "worse than" in-person delivery to allow a conclusion of noninferiority. On the CAPS, this value was determined a priori to be 10 points on the total score.[40] Noninferiority testing procedures involve construction of a 95% confidence interval (CI) on the difference in CAPS scores between the 2 treatment conditions (VTC minus in-person delivery). A positive value indicates greater reduction in PTSD symptoms in the VTC condition compared to the in-person condition. The noninferiority hypothesis is supported if the upper limit of the 95% CI for the difference in intervention effects is less than the preset noninferiority margin. More thorough discussion of noninferiority designs in mental health research is available elsewhere.[41]

Missing values were multiply imputed using the Markov Chain Monte Carlo method via SAS procedure MI.[42] A mixed-effects modeling (MEM) approach (SAS PROC MIXED)[42] was used to estimate differences in CAPS scores between treatment conditions at posttreatment and 3- and 6-month

Figure 1. Study Flowchart



Abbreviation: VTC = videoteleconferencing.

Table 2. Participant PTSD Symptom Scores[a] and Effect Size Estimates for Mean Differences Between Groups at Posttreatment and Follow-Up

		Intent-to-Treat			Completers		
Time Point	Condition	Mean (SD) Score	n	ES Difference[b]	Mean (SD) Score	n	ES Difference[b]
Baseline	In-person	68.9 (13.0)	62	NA	69.0 (13.7)	48	NA
	VTC	72.0 (14.6)	57		71.1 (14.8)	43	
Posttreatment	In-person	58.7 (21.0)	52	−0.27	60.5 (20.9)	47	−0.32
	VTC	55.6 (18.8)	48		55.9 (19.6)	42	
3-Month follow-up	In-person	57.6 (19.7)	48	−0.29	57.4 (19.7)	43	−0.33
	VTC	53.7 (19.0)	46		54.4 (19.2)	41	
6-Month follow-up	In-person	57.7 (19.8)	43	−0.34	57.8 (18.7)	38	−0.36
	VTC	56.2 (18.0)	44		56.5 (18.7)	40	

[a]PTSD symptom scores measured using the Clinician-Administered PTSD Scale.
[b]Effect size differences for VTC vs in-person condition; positive values indicate directionally greater symptom reduction in in-person condition than in the VTC condition, and negative values indicate directionally greater symptom reduction in the VTC condition.
Abbreviations: ES = effect size (as estimated by Cohen *d*), NA = not applicable, PTSD = posttraumatic stress disorder, VTC = videoteleconferencing.

follow-ups adjusting for baseline CAPS scores, potential cluster effects within clinic site and cohorts (therapist-groups), and within-group intervention effects (adjusted change from baseline to each postbaseline assessment point). Between– and within–intervention group effects from MEM analyses were combined across multiple imputations using PROC MIANALYZE.[42] Effect sizes, representing standardized mean differences between treatment conditions or change from baseline within groups, were calculated using the Cohen *d* statistic. Analyses were repeated for the completer sample using the same approach as the ITT sample. Analyses of process variables were conducted using the same MEM approach, but we tested for significant differences between conditions while controlling for clinic site and cohorts (therapist-groups) as covariates at single time points.

RESULTS

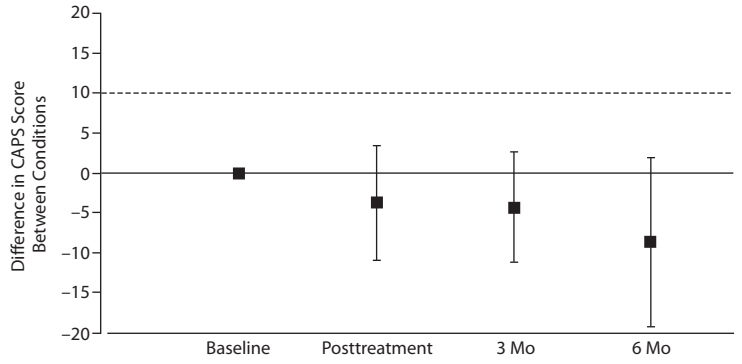
Study Participants

Table 1 describes participant demographic characteristics and psychiatric comorbidity. No significant differences were found between treatment conditions on any background variable. A total of 246 male veterans were referred to and assessed for eligibility for this study (Figure 1), of whom 125 were included in the ITT sample and were randomized and attended the first treatment session. There was no significant difference between the in-person (n = 7) and VTC (n = 12) conditions on the number of veterans who dropped out between randomization and session 1 ($\chi^2_1 = 1.36$, $P = .24$).

Clinical Outcomes

Analyses of CAPS scores at each follow-up time point indicated statistically significant reductions in scores, with no significant effect for treatment condition at any time point (Table 2). Frequency and intensity ratings for each item were summed; a total score of 65 indicated an optimal cutoff score for predicting PTSD diagnosis.[34] Standard effect sizes for change scores between pretreatment and posttreatment, 3-month, and 6-month follow-ups were Cohen $d = 0.78$, 0.73, and 0.76, respectively ($P < .05$ for each). Of

Figure 2. Noninferiority Margins and 95% Confidence Intervals for Differences in CAPS Scores Between Treatment Conditions[a]



[a]The total intent-to-treat sample (N = 125) was used for all analyses. Per-protocol analyses (not shown) yielded similar results. All CIs are 2-sided (95%). The dotted lines show the minimum clinically meaningful differences (10 points for CAPS). A decrease of 10 points on the CAPS represents an approximate effect size of $d = 0.5$, as research with veterans has demonstrated a standard deviation of 20 in this population.[40] The vertical axis represents differences in CAPS change scores between conditions, with negative values indicating greater improvement in PTSD symptoms over time in the VTC group compared to the in-person group.

Abbreviations: CAPS = Clinician-Administered PTSD Scale, PTSD = posttraumatic stress disorder.

those who completed CAPS at each time point, criteria for current PTSD were no longer met by 29.0% of participants at posttreatment, 29.8% at 3-month follow-up, and 26.4% at 6-month follow-up. Also, 57.1% reported a clinically significant change in CAPS scores (greater than 10-point reduction) at posttreatment, while 58.7% and 52.9% maintained clinically significant changes at 3-month and 6-month follow-ups.

Figure 2 depicts mean differences between treatment conditions with 95% CIs for changes in CAPS scores over time in the ITT sample. Clinical outcomes in the VTC condition were not significantly lower than those in the in-person condition, because none of the upper limits of the 95% CIs at the 3 follow-up time points crosses the predetermined margin of noninferiority; thus, the hypothesis that VTC is noninferior to in-person delivery was supported. Results using the completer sample (not shown) demonstrated a similar pattern of results.

Process Outcomes

No differences between conditions were found on any of the process variables (Table 3), with F values < 1.9 and P values > .17 for all comparisons. Results indicated high levels of therapeutic alliance. Participants reported a moderate level of confidence in treatment credibility and expectancies of therapeutic outcomes. At posttreatment, participants reported high levels of satisfaction with the services, rating 11 of 14 items as "very good" or "excellent" on the Charleston Psychiatric Outpatient Satisfaction Scale-VA and reporting a "good" level of satisfaction for logistical items like parking, medical record documentation, and timing of first appointment. Further, 72.1% said they would "definitely" recommend the clinic to friends/family, and another 23.1% said they would "probably" recommend it. On the Telemedicine Satisfaction and Acceptance Scale, VTC participants reported high levels of satisfaction with the VTC modality, with a mean score of 46.9 out of 54 possible (SD = 6.7). Treatment compliance was also high, with participants attending a mean of 9.9 of 12 sessions and 76.8% completing the minimum course of treatment (10 sessions). Participants completed a mean of 8.8 out of 11 between-session practice assignments. No adverse events were observed for any participant. Technical difficulties in the VTC condition were minimal (eg, brief pauses in video feed), were easily resolved, and did not disrupt sessions.

DISCUSSION

Results of this RCT demonstrated that providing manualized evidence-based group psychotherapy for PTSD via VTC is feasible and produces outcomes that are "as good as" in-person delivery. Participants in both the VTC and in-person groups demonstrated meaningful reductions in PTSD symptoms after receiving CPT-C, with no significant differences between conditions, although most still reported moderate levels of PTSD symptomatology at follow-up. At least 50% of participants reported significant clinical reductions in PTSD symptoms during the study, while almost 1 in 3 no longer met PTSD diagnostic criteria at the end of the study. Process outcomes also confirm the acceptability and safety of VTC for these veterans. Participants in both conditions reported high levels of treatment credibility, satisfaction with care, and homework adherence and high alliance with the therapist and other group members. The treatment dropout rate (15.2%) was consistent with the 18%–35% rates reported in other clinical trials with PTSD patients.[43] VTC technology evidenced very few disruptions, and no sessions were canceled due to technological difficulties. No adverse events were observed.

This study is the first methodologically rigorous noninferiority-designed RCT to evaluate the efficacy, safety, and feasibility of using VTC to deliver a trauma-focused psychotherapy for PTSD, CPT-C. Study implementation was rigorously controlled, including a priori noninferiority analyses and sample size calculations, use of a manualized evidenced-based intervention, careful monitoring of therapist fidelity, follow-up assessments up to 6 months, and high participant adherence (75% completed minimum dose of treatment) and retention rates (85% remained in treatment for 12 sessions) in a difficult-to-treat clinical sample. Broad inclusion criteria allowed for high rates of psychiatric comorbidity; therefore, participants are reasonably representative of the broader patient population. The sample included high proportions of rural residents (100%) and racial minorities (54%), 2 groups that have limited access to mental health services and are underrepresented in psychiatric research. This study also provided further evidence for the effectiveness of CPT-C, a variant that is more practical for group administration than

Table 3. Descriptive Statistics and Mixed Models for Process Outcomes[a]

Measure	In-Person Group (n = 64)	VTC Group (n = 61)	Cronbach α	Cohen *d*	*t* (*df*)	*P*
Group Therapy Alliance Scale[b]						
Total	4.5 (0.4)	4.6 (0.4)	.93	−0.08	0.2 (284.9)	.84
Leader-members	4.6 (0.5)	4.6 (0.4)	.85	0.07	0.6 (489.0)	.54
Members-members	4.2 (0.6)	4.3 (0.5)	.80	−0.21	−0.8 (235.7)	.45
Leader-self	4.6 (0.4)	4.7 (0.4)	.87	−0.19	−0.8 (480.9)	.44
Charleston Psychiatric Outpatient Satisfaction Scale-VA	63.9 (10.7)	66.7 (11.6)	.94	−0.25	−0.9 (152.3)	.36
Treatment Expectancy Questionnaire[c]	23.5 (6.9)	24.0 (7.5)	.85	−0.07	−0.3 (2,152.9)	.79
Adherence						
No. of sessions	10.1 (3.1)	9.7 (3.4)		0.10	0.6 (119)	.58
Patients completing treatment, %[d]	78.1	75.4		NA	0.1 (1)	.72
Homework[e]	8.8 (3.3)	8.7 (3.4)		0.05	0.3 (119)	.79

[a]Values expressed as mean (SD) unless otherwise noted.
[b]We constructed the following subscales of the Group Therapy Alliance Scale to differentiate alliance with the group leader (who was located remotely in one treatment condition) from cohesion among group members (who were always together in the same room): (1) relationship between group leader and the members of the group as a whole (leader-members), (2) group cohesion (members-members), and (3) the participant's perception of his or her relationship with the group leader (leader-self).
[c]Treatment expectancy/credibility was assessed at session 2.
[d]Because treatment completion was a binomial variable, the descriptive statistic is the percentage of participants completing at least 10 sessions. Analyses conducted using a χ^2 test.
[e]Homework was measured as the mean (SD) number of between-session practice assignments that were completed and turned in during treatment.
Abbreviations: NA = not applicable, VTC = videoteleconferencing.

traditional CPT. This is the first large-scale demonstration of its effectiveness in a group format.

This study has limitations. For patients in rural areas, their local mental health facilities may not have the technological equipment necessary for VTC; thus, results cannot be generalized to services provided via other technologies. Another limitation is the lack of inclusion of women veterans as study participants. Additionally, participants with acute safety concerns (homicidal or suicidal) or current substance dependence were conservatively excluded. However, there is research suggesting that both substance use and crisis management can be safely addressed via VTC.[44] Generalizability could be limited by the presence of the observer in the room during the VTC groups.

Future research should assess the effectiveness of VTC in other clinical settings and evaluate the use of VTC with other trauma-focused interventions. Research is also needed on the effectiveness and safety of delivering home-based psychotherapy for PTSD; in particular, research would benefit from future investigations of the effectiveness of individual CPT delivered via VTC to patients in their homes compared to office-based individual CPT. The findings of this study highlight the need for future research aimed at understanding what factors are related to treatment outcomes among veterans who continue to experience moderate PTSD after treatment. Cost analyses are necessary to understand the relative costs and cost-benefits of VTC, as well as other systemic and economic implications of increasing access to mental health care.

Current findings demonstrate that VTC is a feasible and efficacious means of delivering evidence-based group psychotherapy for PTSD. VTC technology costs are dropping, thereby increasing system coverage so that VTC is a viable "standard" alternative service delivery modality.[45] Delivering a psychological intervention for PTSD via VTC may be a practical solution to the long-standing access to care disparity that exists for rural and ethnically diverse populations.

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