

Evidence-based telehealth interventions for post-traumatic stress disorder, depression, and anxiety: A systematic review and meta-analysis

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Abstract

Introduction: The goal of this systematic review was to examine the efficacy of behavioral health care treatments for post-traumatic stress disorder (PTSD), depression, and anxiety delivered via telehealth.

Methods: We searched a combination of keywords related to telehealth, relevant mental health disorders, and evidence-based psychotherapies in three databases (PubMed, PsycInfo, and Embase) from database inception to April 2022. We included randomized controlled trials published in English wherein at least one arm received an evidence-based psychotherapy via telehealth. To be included, studies also had to enroll an adult population with symptoms or diagnosis of PTSD, depressive disorder, or anxiety disorder.

Results: Moderate quality of evidence was consistent with only small differences, if any, in efficacy between video teleconferencing (VTC) and in-person delivery for patients with PTSD ($d=0.06$, 95% CI $-0.17, 0.28$). However, for those with depression, in-person delivery was associated with better outcomes compared to VTC ($d=0.28$, 95% CI $0.03, 0.54$; low quality of evidence). We also found that evidence-based treatments delivered over telephone were more efficacious for depression compared to treatment as usual ($d=-0.47$, 95% CI $-0.66, -0.28$; very low quality of evidence). Very low quality of evidence supported the use of telehealth versus waitlist for anxiety ($d=-0.48$, 95% CI $-0.89, -0.09$).

Conclusions: A synthesis across 29 studies indicates that the efficacy of telehealth for delivery of evidence-based behavioral health interventions varies by target diagnosis and telehealth modality. More research is needed on the efficacy of telehealth treatments for depression and anxiety.

Keywords

Telehealth, depression, anxiety, post-traumatic stress disorder, systematic review, meta-analysis

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Introduction

Synchronous telehealth refers to the real-time provision of health care services via telephone or video teleconferencing (VTC) services.¹ Synchronous telehealth provides several advantages when compared to in-person care. Common barriers to behavioral health care include local provider availability, transportation, and scheduling conflicts.² Synchronous telehealth offers more flexibility in terms of scheduling, requires no transportation to a treatment location, and expands the geographical range of providers available to a patient. These advantages may be particularly useful for unique populations, such as military service members who experience frequent relocations and overseas

deployments. Synchronous telehealth can improve the establishment and/or continuity of care and alleviate concerns about privacy and stigma in military service members.^{3,4}

Historically, concerns about the security of technological platforms, ability to effectively manage patient risk, and licensure/jurisdictional boundaries limited the

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use of telehealth in behavioral health care, but much of that changed with the onset of the COVID-19 pandemic in early 2020.⁵ In the United States, restrictions enacted to suppress the COVID-19 pandemic began to proliferate in March 2020. Non-essential medical procedures were suspended and access to medical facilities was limited to medical personnel and patients who could not be treated remotely.⁶ To meet the behavioral health need within the confines of COVID-19 containment measures, many systems adopted platforms to deliver care remotely, and professional organizations passed emergency orders to mitigate barriers related to licensing jurisdictions. For example, in the Military Health System, the use of telehealth markedly increased during the pandemic.⁷ Even as containment measures have abated, many systems maintain some level of telehealth services and multiple studies have shown that patients are satisfied with this service modality.⁸⁻¹⁰

Three recent meta-analyses have examined telehealth modalities for delivery of behavioral health treatment.¹¹⁻¹³ A meta-analysis of telehealth studies with U.S. military veterans¹² of both randomized and non-randomized controlled studies found that in-person treatment was more effective at reducing post-traumatic stress disorder (PTSD) symptoms at posttreatment than VTC ($d = -0.25$, 95% CI -0.39 , -0.11) or telephone ($d = -0.34$, 95% CI -0.56 , -0.11). In this study, authors grouped together in-person alternatives of the same therapy protocol and comparison groups where treatment was not controlled by the study team. The authors also used the standard deviation of the change scores to generate standardized mean differences. This technique can produce biased effect size estimates.¹⁴ Another meta-analysis¹³ did not find a difference between VTC and in-person care at posttreatment for PTSD treatments delivered in primary care ($d = -0.00$, 95% CI -0.18 , 0.17). The discrepant findings across these two reviews may be due to methodological differences (i.e. different populations and inclusion of non-randomized studies in one of the reviews). With respect to depression, McClellan and colleagues¹² found no differences between in-person delivery compared to VTC ($d = 0.00$, 95% CI -0.14 , 0.13) and telephone ($d = -0.09$, 95% CI -0.33 , 0.14), whereas the comparison of in-person delivery to VTC for anxiety was inconclusive ($d = 0.24$, 95% CI -0.17 , 0.54). The small number of included studies and the inclusion of non-randomized studies limit these findings. A more recent meta-analysis included 11 randomized controlled trials (RCTs) that performed head-to-head comparisons of VTC and in-person therapy in the treatment of depression.¹¹ They also found no conclusive differences in treatment efficacy ($g = 0.04$, 95% CI -0.12 to 0.20) or attrition rates (OR = 1.07, 95% CI 0.78 to 1.49). However, these meta-analyses included studies where depression was not the main target and do not speak to the efficacy of treatments that were specifically designed to treat depression. Further, the findings from these meta-analyses are

limited by their focus on specific populations (i.e. veterans only or primary care), inclusion of non-randomized studies which can introduce bias, and scope limitations (i.e. omission of relevant service delivery modalities, comparator groups, and mental health conditions). More comprehensive reviews of the telehealth literature include two rapid reviews^{15,16} and an evidence brief.¹⁷ Overall, the findings from these reviews suggested that telehealth is comparable to in-person delivery. Since none of these reviews conducted meta-analyses, the conclusions are limited.

The Veterans Affairs (VA)/Department of Defense (DOD) clinical practice guidelines (CPGs) highlight the need for further research into this topic. The VA/DOD CPG for the Management of Major Depressive Disorder (MDD) indicates that there was insufficient evidence to recommend for or against telehealth for patients with MDD,¹⁸ citing the lack of RCTs comparing telehealth to in-person treatment and noting limitations of the trials they did find (e.g. population limited to U.S. veterans, telehealth modality limited to VTC). While the VA/DOD CPG for Management of PTSD and Acute Stress Disorder recommends VTC for PTSD, it does not include a recommendation for the use of telephone.¹⁹

The goal of this systematic review was to provide a comprehensive review of the telehealth literature, including different modalities and comparators, and to characterize the state-of-the-science on behavioral health care treatments delivered via telehealth. We performed a meta-analysis and assessed the quality of the evidence across RCTs evaluating the efficacy of evidence-based behavioral health treatment for symptoms or diagnosis of PTSD, depression, or anxiety disorder when delivered via telehealth. Specifically, we sought to answer the following research questions: (a) What is the efficacy of evidence-based interventions for symptoms or diagnosis of PTSD, depression, and anxiety delivered synchronously via telehealth (telephone or VTC) compared to in-person delivery, treatment as usual, or waitlist control? and (b) What is the efficacy of evidence-based interventions delivered via telephone compared to VTC? The synthesis of these findings will help inform future policies and practices related to the provision of evidence-based behavioral health care, as well as address some of the current gaps in the existing syntheses of the literature described above.

Methods

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.²⁰ We registered a protocol for this systematic review with PROSPERO International Prospective Register of Systematic Reviews (PROSPERO Protocol number: CRD42022357247).

Inclusion criteria

We included RCTs (including crossover trials that randomized the order of interventions) published in English of evidence-based telehealth psychotherapies for patients with symptoms or diagnoses of PTSD, depression, or anxiety disorder. For the specific anxiety and depression disorders eligible, see the full eligibility criteria in the Supplementary Material. The telehealth modality had to be delivered synchronously by a provider in real-time via telephone or video. Evidence-based interventions for each condition were determined a priori, based on CPGs that were available at the time we started this review.^{21–24} We excluded interventions where evidence-based treatment had been abbreviated or altered.

Search strategy

A library specialist searched a combination of keywords related to the concepts of telehealth, relevant mental health disorders (i.e. PTSD, anxiety, depression), and evidence-based psychotherapies in three databases (PubMed, PsycInfo, and Embase) from database inception through April 2022. We limited the search to clinical trials published in the English language and utilized controlled vocabulary mapping and concept expansion strategies when applicable. Variations of the complete PubMed search (Supplementary Material) were conducted across all other databases. The team consulted with subject matter experts and searched the National Institutes of Health ClinicalTrials.gov database, World Health Organization's International Clinical Trials Registry Platform, and reference lists of previously published systematic reviews on telehealth^{11–13} to identify additional published clinical trials.

Data screening and assessment of bias and quality of the evidence

The review team dually screened titles and abstracts for eligibility. The team resolved disagreements through discussion and consensus. We obtained full-text articles for records marked for inclusion at the title/abstract stage and dually screened them using the same criteria. The team then used a customized data extraction form to standardize the data collection process and ensure internal reviewer consistency. A single reviewer extracted study characteristics and results for each study, which were reviewed and verified by a second reviewer. The review team also judged the methodological quality of each study (i.e. selection, performance, detection, attrition, reporting, and other bias) using the Cochrane Risk of Bias Tool.²⁵ Each study was assessed by two raters, and discrepancies within each pair of raters were resolved through discussion. Lastly, we used Grading of Recommendations Assessment,

Development and Evaluation (GRADE) system to assess the quality of the evidence for PTSD, depression, and anxiety outcomes using the following five domains: risk of bias, imprecision, inconsistency, indirectness, and publication bias.²⁶

Statistical analysis

We conducted univariate meta-analyses of standardized post-treatment differences in PTSD, anxiety, and depression outcome measures. We analyzed the primary outcomes separately by the target diagnosis of the included studies. We extracted or calculated standardized differences at posttreatment. To the extent possible, we followed the technique of Feingold¹⁴ to generate standardized differences using the baseline standard deviation of the outcome measure. We combined assigned treatment groups that shared a delivery modality, such as in-office telehealth and in-home telehealth, when a study had more than two randomized treatment groups. For studies that reported more than one measure of the primary outcome, we used the clinician-administered measure or the measure that was most consistent with other included studies if they did not differ by administration method. In each meta-analysis, we estimated summary effect sizes using a random effects estimator. We evaluated statistical heterogeneity using the I^2 estimate. When we encountered statistical heterogeneity, we examined potential covariates (evidence-based therapy protocol, study-qualifying diagnosis, and other study design characteristics) to identify potential effect measure modification. We also evaluated evidence of publication bias using funnel plots when possible. We conducted all analyses using Stata 15.²⁷

Results

The database searches yielded 2259 references. Hand-searching reference lists and clinical trial protocol databases produced 12 additional records. After removing duplicates, the team screened 1711 references. A total of 29 studies were subsequently included in the review (see reference list in the Supplementary Materials). The PRISMA flow diagram (Figure 1) provides a detailed accounting of exclusions. Characteristics of included studies are described in Table 1. Fourteen RCTs evaluated telephone interventions, 14 evaluated VTC interventions, and in one RCT, participants could choose either telephone or VTC delivery. There were 14 studies that exclusively enrolled civilians, 11 that exclusively enrolled veterans, and four that enrolled mixed samples (three of which included service members).

Telehealth interventions for PTSD

Twelve studies enrolled participants with PTSD. We conducted a meta-analysis using PTSD symptom data from the 11 studies that compared synchronous VTC to in-person

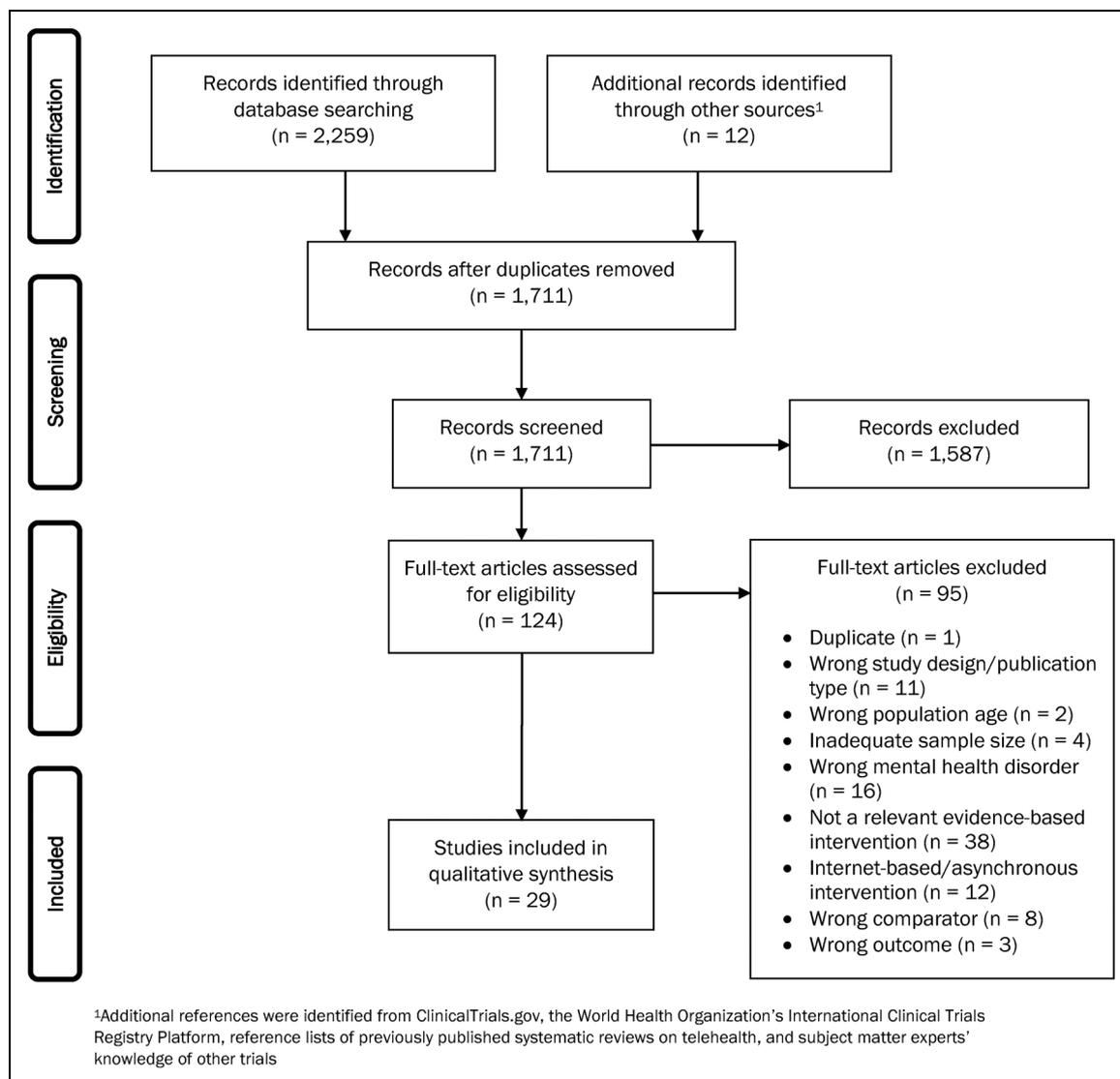


Figure 1. PRISMA flow chart.

treatment directly. The summary effect size and confidence interval across all studies was consistent with no appreciable difference in efficacy; however, this estimate was associated with substantial statistical heterogeneity (Table 2). Stratification by high risk of bias associated with random sequence generation explained some of the observed heterogeneity. Most of the statistical heterogeneity occurred in the subset of studies with a high risk of bias determination. From the studies with low risk of bias in sequence generation, the summary effect size confidence interval was consistent with small differences in efficacy in either direction. There was no evidence of publication bias. We classified the quality of evidence as moderate (Table 3). We did not downgrade the quality of evidence assessment for imprecision despite the confidence interval covering zero²⁸ because the endpoints of the confidence interval were consistent with small effects in either direction. The

lack of study group concealment was a common limitation across the included studies (Figure 2). Only one study provided data on treatment for PTSD delivered via telephone, and the comparison was to treatment as usual as opposed to an in-person version of the same treatment protocol.

Telehealth interventions for depression

Twelve studies examined telehealth in the treatment of depression. Two studies compared VTC to the in-person alternative, one compared VTC to treatment as usual, one compared telephone to in-person delivery, one compared telephone to waitlist, and seven compared telephone delivery to treatment as usual. The confidence interval summary effect size for the two studies that compared VTC to the in-person was consistent with true differences ranging from effectively none to moderate superiority of the

Table 1. Characteristics of included randomized controlled trials.

Study ID	Population	Interventions and modality (Telephone, VTC)	Length of intervention	N randomized/ N completed	Results at posttreatment
Anxiety					
Brenes 2012	Civilian	Telephone CBT Information Only	≥ 8 initial + 4 booster sessions	30/26 30/29	<ul style="list-style-type: none"> Anxiety (Hamilton): $d = -0.81$ (95% CI $-1.36, -0.26$) Quality of life – mental (SF-36): $d = 0.41$ (95% CI $-0.15, 0.97$) Quality of life – physical (SF-36): $d = -0.47$ (95% CI $-1.03, 0.09$)
Danhauer 2022	Civilian	Telephone CBT FtF Hatha Yoga	10 CBT sessions over 10 wks 20 yoga sessions over 10 wks	125/73 125/30	<ul style="list-style-type: none"> Anxiety (PROMIS): $d = -0.05$ (95% CI $-0.32, 0.23$)
Morriss 2019	Civilian	VTC/Telephone CBT TAU	6–12 sessions + up to 3 booster sessions if required	78/55 78/77	<ul style="list-style-type: none"> Anxiety (GAD-7): $d = 0.19$ (95% CI $-0.12, -0.50$)
Olthuis 2015	Civilian	Telephone CBT Waitlist	8 sessions over 8 wks	40/27 40/32	<ul style="list-style-type: none"> Anxiety (DASS-21): $d = -0.65$ (95% CI $-1.20, -0.10$)
Swinson 1995	Civilian	Telephone behavioral Therapy Waitlist	8 sessions over 10 wks	NR/20 NR/22	<ul style="list-style-type: none"> Anxiety (STAI): $d = -0.27$ (95% CI $-0.88, 0.33$) Quality of life (SCL-90): $d = -0.24$ (95% CI $-0.85, 0.37$)
Depression					
Dennis 2020	Civilian	Telephone Interpersonal Psychotherapy TAU	12 sessions over 12 wks	120/113 121/121	<ul style="list-style-type: none"> Depression (SCID): $d = -0.84$ (95% CI $-1.25, -0.43$)
Dwight-Johnson 2011	Civilian	Telephone CBT TAU	8 sessions over 8 wks	50/9 51/12	<ul style="list-style-type: none"> Depression (PHQ9): $d = -0.19$ (95% CI $-0.59, -0.20$) Satisfaction (single-item, 7-point measure; proportion responding ‘very satisfied’): $d = 0.62$ (95% CI $0.22, 1.02$)
Egede 2015	Veteran	VTC BA FtF BA	8 sessions over 8 wks	120/108 121/107	<ul style="list-style-type: none"> Depression (BDI): $d = 0.22$ (95% CI $-0.10, 0.55$) Quality of life (SF-36 emotional well-being): $d = -0.12$ (95% CI $-0.37, 0.13$) Satisfaction (CPOSS): $d = -0.05$ (95% CI $-0.30, 0.20$)
Furukawa 2012	Civilian	Telephone CBT + EAP Waitlist + EAP	8 sessions over 16 wks	58/57 60/60	<ul style="list-style-type: none"> Depression (BDI): $d = -0.92$ (95% CI $-1.30, -0.54$) Mental functioning (K6): $d = -1.03$ (95% CI $-1.42, -0.65$) Occupational functioning – absolute presenteeism (HPQ): $d = 0.18$, (95% CI $-0.18, 0.54$) Occupational functioning – hours worked past 4 weeks (HPQ): $d = 0.08$ (95% CI $-0.28, 0.44$) Occupational functioning – relative presenteeism (HPQ): $d = 0.16$ (95% CI $-0.20, 0.52$)

(continued)

Table 1. Continued

Study ID	Population	Interventions and modality (Telephone, VTC)	Length of intervention	N randomized/ N completed	Results at posttreatment
Luxton 2016	Mixed - Active duty military, Veteran	VTC BA FtF BA	8 sessions over 8 wks	62/40 59/42	<ul style="list-style-type: none"> Satisfaction (investigator-developed single-item question): $d = 0.81$ (95% CI 0.44, 1.19) Depression (BDI): $d = 0.39$ (95% CI -0.04, 0.81) Satisfaction (CSQ): $d = -0.14$ (95% CI -0.56, 0.28)
Lynch 1997	Civilian	Telephone PST TAU	6 sessions over 6 wks	15/11 14/14	<ul style="list-style-type: none"> Depression (Hamilton): $d = -0.38$ (95% CI -1.19, 0.43)
Miller 2002	Civilian	Telephone Interpersonal Psychotherapy TAU	12 sessions over 12 wks	18/9 15/15	<ul style="list-style-type: none"> Depression (HAMDD): $d = -1.00$ (95% CI -1.76, -0.24) Functioning - mental health (GAS): $d = 0.81$ (95% CI 0.07, 1.56) Functioning - social (SAS-SR): $d = -0.16$ (95% CI -0.87, 0.56) Functioning - social, partner (SAS-SR): $d = -1.20$ (95% CI -1.97, -0.42) Functioning - social, work (SAS-SR): $d = -0.94$ (95% CI -1.70, -0.19)
Mohr 2011	Veteran	Telephone CBT TAU	16 sessions over 20 wks	41/32 44/NR	<ul style="list-style-type: none"> Depression (PHQ9): $d = -0.37$ (95% CI -0.83, 0.09)
Mohr 2012	Civilian	Telephone CBT FtF CBT	18 sessions over 18 wks	163/129 162/109	<ul style="list-style-type: none"> Depression (PHQ9): $d = -0.02$ (95% CI -0.24, 0.20) Therapeutic alliance - client (WAI): $d = -1.02$ (95% CI -1.27, -0.78) Therapeutic alliance - therapist (WAI): $d = -0.36$ (95% CI -0.59, -0.12)
O'Neil 2015	Civilian	Telephone CBT TAU	10 sessions over 25.98 wks	61/NR 60/NR	<ul style="list-style-type: none"> Depression (PHQ9): $d = -0.26$ (95% CI -0.65, 0.12) Quality of life - mental (SF-12): $d = 0.27$ (95% CI -0.11, 0.66) Quality of life - physical (SF-12): $d = 0.26$ (95% CI -0.12, 0.64)
Piette 2011	Mixed - Civilian, Veteran	Telephone CBT TAU	12 weekly + 9 monthly booster sessions over 12 mos	172/NR 167/NR	<ul style="list-style-type: none"> Depression (BDI): $d = -0.51$ (95% CI -0.74, -0.27) Quality of life - mental (SF-12): $d = 0.15$ (95% CI -0.08, 0.38) Quality of life - physical (SF-12): $d = 0.09$ (95% CI -0.14, 0.32) Quality of life - social functioning (SF-12): $d = 0.12$ (95% CI -0.11, 0.35)
Scogin 2018	Civilian	VTC Integrated CBT TAU	10 sessions over 10 wks	22/13 18/NR	<ul style="list-style-type: none"> Depression (Hamilton): $d = -0.26$ (95% CI -1.10, 0.59)
PTSD Acierno 2016	Veteran	VTC BA + Therapeutic Exposure FtF BA + Therapeutic Exposure	8 sessions	134/NR 131/NR	<ul style="list-style-type: none"> PTSD (PCL): $d = 0.01$ (95% CI -0.27, 0.28)

(continued)

Table 1. Continued

Study ID	Population	Interventions and modality (Telephone, VTC)	Length of intervention	N randomized/ N completed	Results at posttreatment
Acierno 2017	Veteran	VTC PE FtF PE	10–12 sessions over 12 wks	76/55 74/43	<ul style="list-style-type: none"> PTSD (PCL): $d = 0.29$ (95% CI $-0.06, 0.63$) Satisfaction (SDPQ): $d = -0.07$ (95% CI $-0.56, 0.41$) Satisfaction – appearance of facility (CPOSS): $d = -0.14$ (95% CI $-0.63, 0.35$) Satisfaction – convenience of facility (CPOSS): $d = 0.11$ (95% CI $-0.38, 0.60$) Satisfaction – recommendation (CPOSS): $d = 0.06$ (95% CI $-0.43, 0.55$) Satisfaction – respectful care (CPOSS): $d = -0.06$ (95% CI $-0.55, 0.43$)
Acierno 2021	Veteran	VTC PE FtF PE	12–15 sessions over 12–15 wks	69/34 67/33	<ul style="list-style-type: none"> PTSD (PCL-5): $d = 0.37$ (95% CI $-0.04, 0.77$)
DuHamel 2010	Civilian	Telephone CB TTAU	10 sessions over 10 wks	52/NR 37/NR	<ul style="list-style-type: none"> PTSD (PCL): $d = -0.19$ (95% CI $-0.62, 0.23$)
Franklin 2017	Veteran	VTC (iPhone) PE VTC (Computer) PE FtF TAU	10 sessions over 12 wks	12/3 7/4 8/8	<ul style="list-style-type: none"> PTSD (CAPS): $d = -2.04$ (95% CI $-3.38, -0.70$)
Frueh 2007	Veteran	VTC Group CBT FtF Group CBT	14 sessions over 14 wks	17/9 21/12	<ul style="list-style-type: none"> PTSD (PCL): $d = 0.38$ (95% CI $-0.49, 1.25$) Psychiatric functioning (SCL-90-R): $d = 0.47$ (95% CI $-0.41, 1.34$) Social functioning (quality of social relationships): $d = -0.70$ (95% CI $-1.59, 0.19$)
Liu 2020	Veteran	VTC CPT FtF CPT	12 sessions over 12 wks	103/78 104/68	<ul style="list-style-type: none"> PTSD (CAPS): $d = 0.55$ (95% CI $0.28, 0.83$)
Maieritsch 2016	Veteran	VTC CPT FtF CPT	at least 10 sessions	45/25 45/28	<ul style="list-style-type: none"> PTSD (CAPS): $d = -0.16$ (95% CI $-0.71, 0.39$) Therapeutic alliance (WAI): $d = -0.12$ (95% CI $-0.67, 0.44$)
Morland 2014	Veteran	VTC Group CPT-C In-person Group CPT-C	12 sessions over 6 wks	68/51 76/56	<ul style="list-style-type: none"> PTSD (CAPS): $d = -0.27$ (95% CI $-0.66, 0.12$) Satisfaction – convenience of facility (CPOSS - VA): $d = 0.25$ (95% CI $-0.13, 0.64$) Therapeutic alliance - leaders (GTAS): $d = 0.00$ (95% CI $-0.38, 0.38$) Therapeutic alliance – leader self (GTAS): $d = 0.25$ (95% CI $-0.14, 0.63$) Therapeutic alliance - member (GTAS): $d = 0.18$ (95% CI $-0.20, 0.56$) Therapeutic alliance - total (GTAS): $d = 0.25$ (95% CI $-0.14, 0.63$)

(continued)

Table 1. Continued

Study ID	Population	Interventions and modality (Telephone, VTC)	Length of intervention	N randomized/ N completed	Results at posttreatment
Morland 2015	Mixed – Civilian, Active duty military, Veteran	VTC CPT FtF CPT	12 sessions over 6–12 wks	61/48 63/50	<ul style="list-style-type: none"> PTSD (CAPS): $d = -0.18$ (95% CI $-0.53, 0.18$) Satisfaction – convenience of facility (CPOSS - VA): $d = -0.21$ (95% CI $-0.56, 0.14$) Therapeutic alliance – client (WAI-S): $d = -0.03$ (95% CI $-0.38, 0.32$) Therapeutic alliance – therapist (WAI-S): $d = -0.04$ (95% CI $-0.39, 0.31$)
Morland 2020	Veteran	Home-Based VTC PE Office-Based VTC PE In-home FtF PE	6–15 sessions over 6–15 wks	58/54 59/54 58/53	<ul style="list-style-type: none"> PTSD (CAPS-5): $d = 0.22$ (95% CI $-0.14, 0.59$)
Peterson 2022	Mixed – Active duty military, Veteran	VTC CPT FtF (in-office) CPT FtF (in-home) CPT	12 sessions over 6 wks	44/29 44/25 32/25	<ul style="list-style-type: none"> PTSD (CAPS-5): $d = -0.19$ (95% CI $-0.74, 0.37$)

BA: behavioral activation; BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory; CAPS: Clinician-Administered PTSD Scale for DSM-5; CBT: cognitive behavioral therapy; CPOSS: Charleston Psychiatric Outpatient Satisfaction Scale; CPT: cognitive processing therapy; CPT-C: cognitive processing therapy - cognitive only; CSQ: Client Satisfaction Questionnaire; DASS-21: Depression, Anxiety and Stress Scale - 21 items; EAP: Employee Assistance Program; FtF: Face-to-Face; GAD-7: General Anxiety Disorder-7; GAS: Global Assessment Score; GTAS: Group Therapy Alliance Scale; HAMD: Hamilton Depression Rating Scale; HPQ: Health and Work Performance Questionnaire; K6: Kessler Psychological Distress Scale; Min: minutes; Mos: months; NR: not reported; PCL: PTSD Checklist; PE: prolonged exposure; PROMIS: Patient-Reported Outcomes Measurement Information System; PHQ9: Patient Health Questionnaire; PST: problem solving therapy; PTSD: post-traumatic stress disorder; SAS-SR: Social Adjustment Scale-Revised Version; SCID: Structured Clinical Interview for the DSM-5; SCL-90: Symptom Checklist-90; SDPQ: Service Delivery Perceptions Questionnaire; SF-12: Short Form-12; SF-36: 36-item Short Form Health Survey (SF-36); STAI: State-Trait Anxiety Inventory; TAU: treatment as usual; VTC: video teleconference; WAI: Working Alliance Inventory; WAI-S: Working Alliance Inventory - Short Form; wks: weeks; VA: Veterans Affairs.

Table 2. Meta-analysis results, by outcome and comparison.

Outcome	Comparison	No. studies	SMD	95% CI	I ²
PTSD	VTC vs. in-person protocol, overall	11	0.06	-0.17, 0.28	68.26%
	Low-sequence generation risk of bias	8	0.08	-0.09, 0.25	24.12%
	High-sequence generation risk of bias	3	-0.27	-0.14, 0.59	90.59%
Depression	VTC vs. in-person protocol	2	0.28	0.03, 0.54	0.00%
Depression	Telephone vs. TAU	7	-0.47	-0.66, -0.28	27.54%
Anxiety	Telephone vs. waitlist	2	-0.48	-0.89, -0.09	0.00%

SMD: standardized mean difference; CI: confidence interval; VTC: video teleconference; TAU: treatment as usual. Note: Negative mean differences favor telehealth.

in-person protocol. We rated the quality of evidence for this comparison as low because of study-specific risk of bias and imprecision.

The evidence across the seven studies that compared telephone delivery to treatment as usual was consistent with small-to-moderate superiority of telephone delivery. Since this comparison did not involve the same treatment protocol for both study groups, we cannot isolate the effect attributable to telehealth. We rated the quality of

the evidence as very low for individual study risk of bias, indirectness, and imprecision.

Telehealth interventions for anxiety

Five studies targeted anxiety as the primary diagnosis. Two studies compared telephone to waitlist. The other three studies each differed in the type of comparison under study. The summary effect size estimate and confidence

Table 3. GRADE quality of evidence.

No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other	GRADE of evidence for outcome
11	RCT	Serious (-1)	No inconsistency	No indirectness	No imprecision	None	Moderate
2	RCT	Serious (-1)	No inconsistency	No indirectness	Serious imprecision (-1)	None	Low
7	RCT	Serious (-1)	No inconsistency	Serious indirectness (-1)	Serious imprecision (-1)	None	Very low
2	RCT	Serious (-1)	No inconsistency	Serious indirectness (-1)	Serious imprecision (-1)	None	Very low

GRADE: Grading of Recommendations Assessment, Development and Evaluation; PTSD: posttraumatic disorder; RCT: randomized controlled trial; TAU: treatment as usual; VTC: video teleconference.

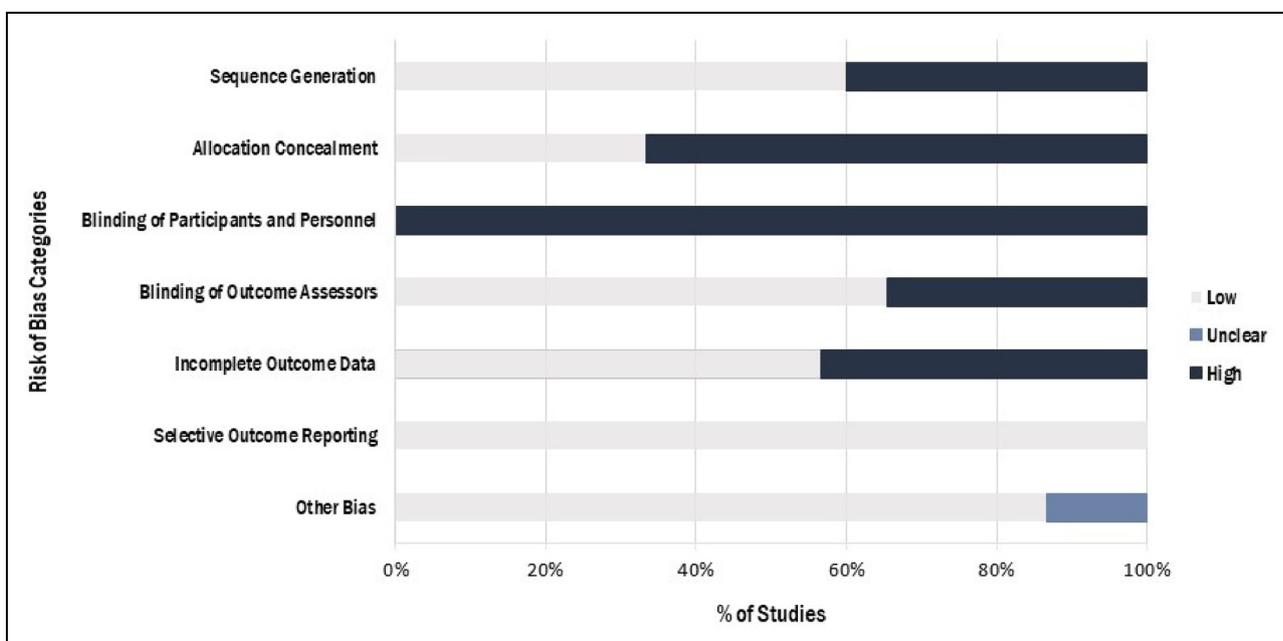


Figure 2. Cochrane risk of bias assessment.

interval for the two studies that compared telephone delivery to waitlist were consistent with superiority of telephone delivery. The confidence interval was consistent with both very small and very large true differences. We rated the quality of evidence as very low for study-specific risk of bias, indirectness, and imprecision.

Effects of telehealth interventions for PTSD, depression, and anxiety on secondary outcomes

The majority ($k=20$) of studies examined additional outcomes such as quality of life, therapeutic alliance, satisfaction with treatment, and functioning within important life domains (e.g. mental, physical, social, and occupational). The estimates for these outcomes are reported in Table 1. The heterogeneity of the measures used, target diagnoses,

and modalities compared across each of these constructs precluded computation of meta-analytic estimates. In general, patients assigned to telehealth interventions may have greater improvements in mental health functioning post-intervention relative to treatment as usual or information control and did not differ from those assigned to in-person delivery. However, the results were inconclusive for other types of functioning and quality of life. Further, patients randomized to telehealth treatment expressed a high degree of therapeutic alliance and satisfaction.

Discussion

A synthesis across 29 studies indicated that the efficacy of telehealth for delivery of evidence-based behavioral health interventions varies by target diagnosis and telehealth

modality. Moderate quality of evidence showed that VTC may be comparable to in-person delivery for patients with PTSD. However, for those with symptoms or diagnosis of depression, in-person delivery was associated with better outcomes compared to VTC. We also found that evidence-based treatments delivered over telephone were more efficacious for depression compared to treatment as usual; however, the quality of the evidence was rated as very low. Very low quality of evidence supported the use of telehealth versus waitlist for symptoms or diagnosis of anxiety.

Our findings are consistent with other research showing that VTC and in-person delivery may be comparable for patients with PTSD.^{11–13,15,16} However, our findings with respect to VTC for depression diverge from other meta-analyses.^{11,12} Those meta-analyses included studies where depression was not the main target. Thus, unlike our findings, they do not speak to the efficacy of evidence-based treatments that were specifically designed to treat depression. The results support the conclusions of other research regarding the benefits of telehealth for psychology, psychiatry, and across other medical disciplines.^{29,30} Our findings are relevant to workgroup members engaged in the updates of CPGs. The VA/DOD MDD CPG currently states that there is insufficient evidence to recommend telehealth for the treatment of MDD.¹⁸ Our finding that telephone may be more beneficial than treatment as usual indicates the need to reevaluate these recommendations in the future. Our findings also support the current recommendations for evidence-based treatment delivered via VTC for PTSD.¹⁹

No studies directly compared telehealth modalities (i.e. VTC versus telephone) and indirect comparison between modalities was not possible due to use of different comparators across modalities (in-person for VTC studies and treatment as usual/waitlist for telephone studies). Though some evidence supports the delivery of evidence-based interventions via telephone, research comparing telephone to in-person delivery or VTC is needed.

Limitations and future directions

We included only English language studies. Our findings only apply to evidence-based treatments delivered via telehealth; non-evidence-based treatments were outside the scope of this review. This body of research included studies that used self-report measures for the measurement of mental health symptoms. Clinician-rated outcomes minimize concerns related to blinding of outcome assessment. Future telehealth studies should utilize clinician-rated tools to measure outcomes.

Greater use of telehealth interventions may be promising for increasing access to evidence-based behavioral health treatment among certain populations. Telehealth may be particularly useful for service members who deploy to remote areas and individuals who live in rural settings. However, more research is needed on the efficacy of telehealth

treatments for depression and anxiety. The field would benefit from studies comparing telehealth to in-person delivery. Future studies should also compare different telehealth modalities to each other. Because some patients might prefer telephone to VTC or vice versa, greater choice with respect to modality might improve adherence to treatment. Currently, smartphones offer patients the choice of auditory and VTC options for connecting with providers.

Further, this body of literature is limited in the breadth of the evidence-based interventions that were evaluated for telehealth. For patients with PTSD, only prolonged exposure and cognitive processing therapy were evaluated. For depression, RCTs examined behavioral activation, cognitive behavioral therapy, and interpersonal therapy. Only cognitive behavioral therapy was evaluated in patients with anxiety. Future research should evaluate telehealth delivery for other types of evidence-based interventions.

Conclusions

A synthesis across 29 studies indicates that the efficacy of telehealth for delivery of evidence-based behavioral health interventions varies by target diagnosis and telehealth modality. More research is needed on the efficacy of telehealth treatments for depression and anxiety. Research is needed to compare telephone to in-person delivery and VTC. This body of literature is limited in the breadth of the evidence-based interventions that were evaluated for telehealth.

Declarations of conflicting interests

The views expressed are those of the authors and do not represent the official policy or position of the Psychological Health Center of Excellence, Defense Health Agency, Department of Defense, or the United States Government.

This systematic review has been conducted to inform Military Health System stakeholders on the state-of-the-science on telehealth. The results presented here are relevant to military and civilian populations alike. Our forthcoming dissemination efforts discuss relevance of this topic to military service members and other Military Health System beneficiaries.

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Data availability statement

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

Supplemental Material

Supplemental material for this article is available online.

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