

Remote cognitive-behavioral therapy for generalized anxiety disorder: A preliminary meta-analysis

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Abstract

Background: Generalized anxiety disorder (GAD) is a chronic mental health condition that results in significant individual, societal, and economic burden. While cognitive behavioral therapy (CBT) is well established as an efficacious treatment for GAD, individuals have identified several logistical barriers to accessing face-to-face CBT. Remotely delivered treatments address many of these treatment barriers.

Methods: The aim of the current study was to synthesize the current literature on the efficacy of remote CBT for GAD using a meta-analytic approach. Relevant articles were identified through an electronic database search and 10 studies (with 11 remote conditions and 1071 participants) were included in the meta-analysis.

Results: Within-group findings indicate that remote CBT for GAD results in large effect sizes from pretreatment to posttreatment ($g = 1.30$; 95% confidence interval [CI]: 1.03–1.58). Both low intensity and high intensity remote CBT interventions were found to result in large effect sizes ($g = 1.36$; 95% CI: 1.11–1.61 and $g = 0.83$; 95% CI: 0.20–1.47, respectively), with no significant differences

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between the treatment formats ($Q_1 = 2.28$, $p = 0.13$). Between-group effect sizes were medium in size at posttreatment ($g = 0.76$; 95% CI: 0.47–1.06).

Conclusions: These findings have potential implications for the delivery of evidence-based treatment for GAD and the inclusion of remote methods in stepped care treatment approaches.

KEYWORDS

anxiety, cognitive behavioral therapy, generalized anxiety disorder, meta-analysis, remote treatment

1 | INTRODUCTION

Generalized anxiety disorder (GAD) is characterized by excessive and uncontrollable worry about a variety of domains, which is accompanied by a number of physical and/or cognitive symptoms (American Psychiatric Association, 2013). The disorder is often chronic in nature (Hoge et al., 2004) and results in considerable individual, economic, and societal burden (Konopka & König, 2020). GAD is a common mental health condition, with a lifetime prevalence of 3.7% and 12-month prevalence of 1.8% (Ruscio et al., 2017). Research demonstrates that individuals with GAD encounter a range of logistical barriers to engaging in treatment, including making time for treatment and transportation barriers (Goetter et al., 2020). Additionally, the COVID-19 pandemic has required most psychological therapy to be provided online. Remotely delivered treatment overcomes many of the barriers to accessing face-to-face treatment.

1.1 | Treatment and remote delivery modes

The efficacy of cognitive behavioral therapy (CBT) for the treatment of GAD is well established, with large effect sizes ($g = 1.01$) found in recent meta-analyses (Carpenter et al., 2018). In addition to standard face-to-face treatment, CBT for GAD can also be delivered through several remote treatment methods. Remote treatments are those that do not require the physical co-location of the therapist and client. They can be delivered using various formats and the extent of therapist contact can range from brief asynchronous contact (i.e., low intensity remote interventions) to synchronous (real-time) contact with a therapist (i.e., high intensity remote interventions) (Wootton, 2016).

1.1.1 | Low intensity remote CBT

Low intensity remote CBT requires individuals to systematically complete structured lessons or modules that share the same information commonly taught in face-to-face treatment settings without the presence of a therapist in real time (e.g., an individual and therapist do not have to be engaged in therapy at the same time). Commonly used low intensity remote interventions include internet-delivered CBT, smartphone application-based CBT, and bibliotherapy-delivered CBT. These low intensity interventions can be delivered in either a clinician-guided or self-guided fashion. Internet-delivered CBT involves patients working their way through structured online lessons

(Wootton, 2016). The evidence for internet-delivered CBT for GAD is robust with a number of meta-analyses demonstrating medium to large pooled effects across studies (Andrews et al., 2018; Richards et al., 2015). Application-based CBT involves accessing CBT interventions via an application on a smartphone or tablet. Given this technology is a relatively new way of delivering therapy, research is still emerging; however, early evidence has shown that it is efficacious in the treatment of GAD (Carl et al., 2020; Miller et al., 2021). Bibliotherapy-delivered CBT involves the patient conducting their own treatment using a printed, hardcopy workbook (Wootton, 2016). Studies that have investigated guided bibliotherapy-delivered CBT for GAD have shown significant declines in anxiety, worry, depression, quality of life, and stress, compared to waitlist controls (Butler et al., 1987).

While low intensity interventions have demonstrated efficacy, they are often criticized for lacking real-time contact with a therapist, which may adversely impact treatment adherence and motivation (Christensen et al., 2009). Additionally, many individuals with anxiety disorders prefer face-to-face treatment over low intensity treatment approaches (Berle et al., 2015). High intensity remote CBT interventions are analogous to traditional face-to-face treatment, and while research is lacking, these treatment approaches may be more acceptable to patients with GAD who cannot access standard face-to-face treatment and who do not wish to use low intensity treatments.

1.1.2 | High intensity remote CBT

High intensity remote CBT utilizes technology to deliver treatment that is equivalent to traditional face-to-face therapy in terms of the content of the intervention, length of session (i.e., 60–90 min), and therapist interaction. Unlike low intensity methods, these interventions are delivered in real-time. There is evidence demonstrating that high intensity remote CBT results in equivalent outcomes compared to traditional face-to-face treatment across a number of common mental health disorders (Varker et al., 2019). The research on this approach specifically in GAD samples is extremely limited however.

Commonly used high intensity interventions include telephone-delivered CBT and traditional or internet-delivered videoconferencing. Telephone-delivered CBT involves the client and therapist interacting over the telephone. In GAD samples, most of the research demonstrating the efficacy of this approach has focused on older adult populations (Brenes et al., 2015), who may feel more comfortable with this mode of delivery than other high intensity remote CBT approaches. Videoconferencing-delivered CBT involves the therapist and client working together over video-link, maintaining the visibility of the therapist and allowing observation of the clients' nonverbal behavior. An increasing amount of studies have demonstrated the efficacy of videoconferencing-delivered CBT for a number of anxiety and related disorders (Berryhill et al., 2019). While there has been little research conducted on the efficacy of videoconferencing-delivered CBT for GAD specifically, early results from exploratory research in this area are promising (Théberge-Lapointe et al., 2015).

1.2 | Aims of the current study

Overall, remote CBT is emerging as an efficacious treatment for GAD. These treatment approaches have the potential to reduce barriers to treatment and the resultant burden caused by GAD. While some excellent meta-analyses of remote treatment for GAD are available (e.g., Andrews et al., 2018; Richards et al., 2015) there are a number of limitations with these studies. First, they focus on one particular kind of remote CBT for GAD, namely internet-delivered CBT and currently it is unclear how the various remote treatment methodologies compare against each other, particularly the difference between low and high intensity interventions. Second, some reviews include prevention studies along with efficacy studies, which may confound the overall effect sizes. Finally, many studies in these meta-analyses include participants without a diagnosis of GAD, thus our knowledge of how these

findings relate specifically to those with a diagnosed disorder is limited. The current study aims to address these limitations and extend the research by examining the efficacy of remote CBT using a meta-analytic approach. The current study has the potential to inform health care policy around stepped-care approaches to treatment to ensure that patients with GAD are able to access the most efficacious, yet most cost-effective treatment possible for their mental health condition.

2 | METHOD

2.1 | Search procedure

Relevant research papers were sourced through electronic databases (Scopus, Medline, Embase, and PsycINFO) through to June 2021. Articles were identified by combining the following search terms: "generalized anxiety disorder" or "GAD" AND "cbt" or "cognitive therap*" or "behavio* therapy" or "icbt" AND "internet" or "phone" or "online" or "web*" or "video*" or "conferenc*" or "bibliotherapy" or "computeri*" or "dvd" or "cd" or "distance" or "remote" or "self-help" or "ele.*" The studies were then grouped by type of treatment delivery method (i.e., internet-delivered, application-delivered, videoconference-delivered or telephone-delivered CBT) as well as by intensity of remote treatment (i.e., high intensity treatment incorporated videoconferencing-delivered and telephone-delivered CBT and low intensity treatment included internet-delivered and application-delivered CBT). The meta-analysis was preregistered with the International Prospective Register of Systematic Reviews (PROSPERO) (Record ID = 160786).

2.2 | Study selection

To be included in the analysis individual studies were required to satisfy the following inclusion criteria: (1) the study needed to be a clinical trial or case series with pooled data amenable to meta-analysis; (2) the treatment was required to specifically target GAD symptoms; (3) the treatment was required to be a remotely delivered treatment (i.e., no more than 120 min of in-office face-to-face treatment); (4) the study was required to use a validated measure of generalized anxiety as an outcome measure; (5) the treatment used was required to be a CBT monotherapy; (6) the study was required to be published in English and adequately describe the treatment methodology; (7) data were required to be original and published in a peer-reviewed journal; (8) the sample was required to be aged over 18; and (9) subjects included must have a GAD diagnosis assigned via a diagnostic interview. Both uncontrolled trials and randomized controlled trial (RCTs) were included. The preferred reporting items for systematic reviews and meta-analyses guidelines (Page et al., 2021) were followed and the flow chart is outlined in Figure 1. The search procedure was conducted by the first author, while the final author co-reviewed at least 10% of articles at the abstract and full text review screening stages, as well as all final included studies to ensure all studies met the inclusion criteria.

2.3 | Data analysis

Effect size data were analyzed using Comprehensive Meta-Analysis Version 3 (Borenstein et al., 2016). Where a study had multiple conditions, each relevant condition was treated as a separate trial. Data were extracted from the measure outlined as the primary outcome measure. Where more than one outcome measure was listed, or where the primary outcome measure was not defined, we extracted data from the GAD Scale-7 Item (GAD-7; Spitzer et al., 2006) where possible, followed by the Penn State Worry Questionnaire (PSWQ; Meyer et al., 1990).

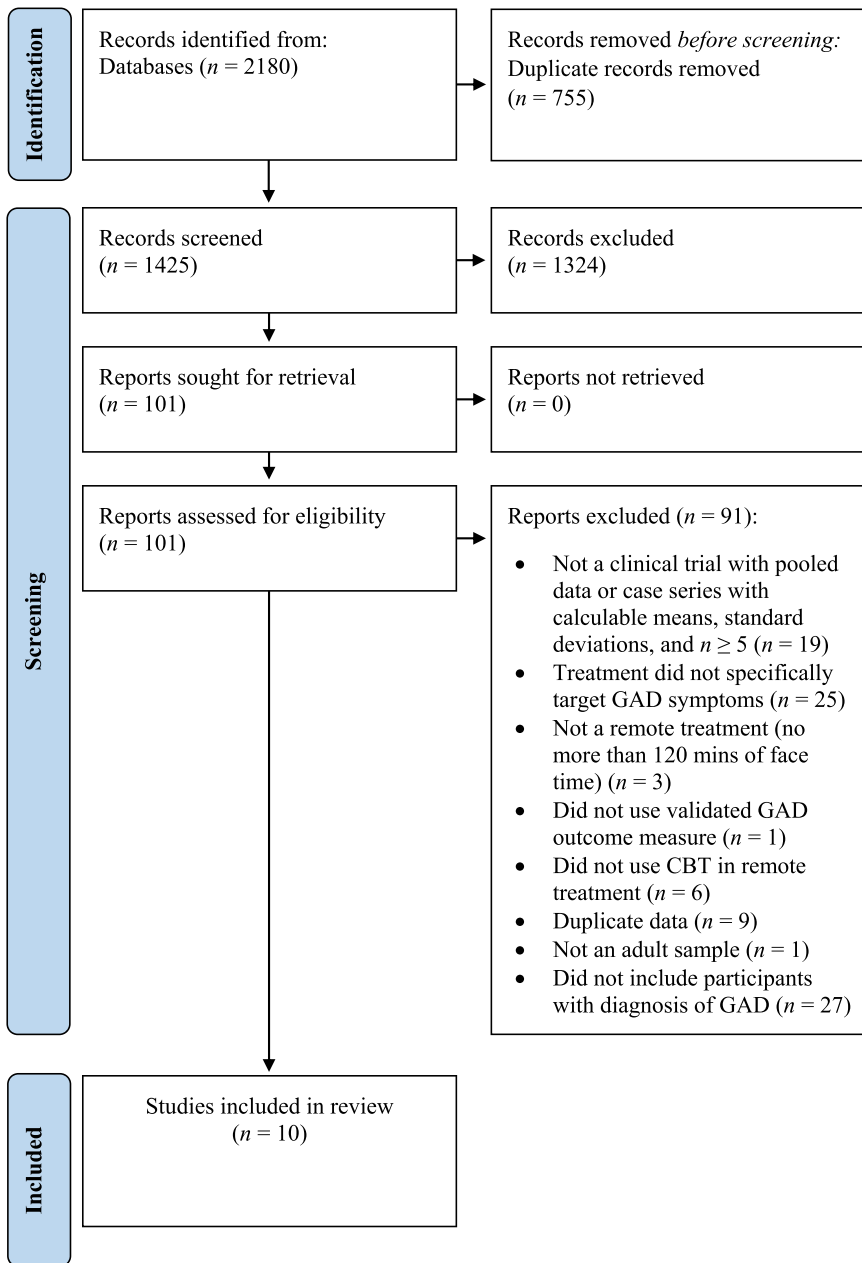


FIGURE 1 Study flow chart

Data were extracted by the first author and accuracy was checked by the final author. Intention to treat (ITT) data were obtained where available. Effect sizes were calculated using Hedges' g with 0.2 identified as a small effect, 0.5 as a medium effect, and 0.8 or greater identified as a large effect (Durlak, 2009). Effect sizes were calculated based on recommendations by Borenstein et al. (2016) and used the random effects model for both within-group and between-group effects.

For within-group analyses, effect sizes were calculated for remote treatment overall and a positive g value indicates a decrease in GAD symptoms from pretreatment to posttreatment (or follow-up) with a larger value

indicating a larger effect. Between-group analyses were conducted between the remote CBT treatment and control conditions by comparing the posttreatment (or follow-up) scores of each group (Higgins & Deeks, 2008). For the between-group comparisons, a positive g value indicates a superiority of the remote treatment compared with other treatments and a negative g value indicates inferiority. Moderator analyses were also conducted. For categorical moderators, effect sizes of each group were compared; for continuous moderators, meta-regression was used.

The I^2 statistic was used to examine homogeneity of effect sizes with 25%, 50%, and 75% indicating low, moderate, and high heterogeneity respectively (Higgins et al., 2003). Moderator analyses for type and intensity of remote treatment were conducted where there was a moderate level of heterogeneity (i.e., $\geq 50\%$) and sample size permitted. Sensitivity analyses were completed using the "one-study removed" method. Each study was systematically removed to determine any impact of an individual study on overall effect size. Publication bias was assessed by inspection of funnel plots, followed by a trim-and-fill procedure, which generates an estimate of the pooled effect size after accounting for bias (Borenstein et al., 2016; Duval & Tweedie, 2000). A quality analysis for each study was conducted using the Psychological Outcomes Study Methodology Rating Form (Öst, 2008). For the quality analyses at least 80% of studies were coded independently by two researchers (V. B. and B. W.). Intraclass correlation coefficient (ICC) estimates were calculated based on a mean-rating ($k = 2$), absolute-agreement, two-way mixed-effects model. Final quality ratings were based on the first authors' ratings and are outlined in Table 1.

3 | RESULTS

3.1 | Study selection

Figure 1 outlines the study selection process. The search yielded 2180 articles. After the removal of duplicates and screening based on titles, abstracts were reviewed and 1324 were further excluded, resulting in 101 studies. These 101 studies were reviewed in full against the inclusion and exclusion criteria and 91 were excluded, resulting in 10 included studies (with 11 comparisons) in the meta-analysis.

3.2 | Study characteristics

Table 1 provides an overview of all studies included in the analysis, as well as the type of remote treatment that was provided. In total 1071 individuals across 10 studies (with 11 remote treatment conditions) were included in the analysis. Control conditions included telephone-delivered nonspecific therapy, internet-delivered psychodynamic therapy, and waitlist controls. As outlined in Table 1, studies reported mean ages ranging from 30.9 (SD = 10.7) to 66.8 (SD = 6.2). A large portion of participants were female ($M = 73.5\%$). Seven out of 11 interventions (64%) used an internet-delivered CBT approach, 2/11 (18%) used an application-based CBT approach, 1/11 (9%) used a videoconferencing-delivered CBT approach, and 1/11 (9%) used a telephone-delivered CBT approach. From this 9/11 (82%) were deemed to be low intensity interventions (internet-delivered and application-based CBT) and 2/11 (18%) were deemed to be high intensity interventions (videoconferencing and telephone-delivered CBT).

Three out of the 10 studies were conducted in Australia (30%), followed by Sweden (2/10; 20%), Canada (2/10; 20%), the United States of America (1/8; 10%), and the United Kingdom (1/10; 10%). One of the 10 studies (10%) was conducted across both the United Kingdom and United States of America. Four of the 10 studies (40%) used the PSWQ (Meyer et al., 1990) as a primary outcome measure and 6/10 (60%) used the GAD-7 (Spitzer et al., 2006). Over half (7/10; 70%) of the studies were RCTs and 3/10 (30%) were uncontrolled trials. Study quality ranged from

TABLE 1 Characteristics of included studies

Study	Country	Study type	Study quality	Treatment type	N	Treatment length (weeks)	Outcome measure	Mean age (SD)	% female	Longest follow-up (months)
Andersson et al. (2012)	Sweden	RCT	32	ICBT	81	8	PSWQ	NS	76.5	18
Brenes et al. (2015)	USA	RCT	34	TCBT	141	10	PSWQ	66.8 (6.2) ^a	81.6	4
Carl et al. (2020)	UK/USA	RCT	25	AppCBT	256	6	GAD-7	30.9 (10.7)	68.4	1
Dear et al. (2015)	Australia	RCT	29	ICBT	168 ^b	8	GAD-7	43.2 (11.86)	77.0	24
Hadjistavropoulos et al. (2014)	Canada	OT	17	ICBT	112	12	GAD-7	38.7 (11.87)	64.3	N/A
Miller et al. (2021)	UK	OT	22	AppCBT	21	6	GAD-7	43.0 (14.35)	95.2	1
Paxling et al. (2011)	Sweden	RCT	29	ICBT	89	8	PSWQ	39.3 (10.80)	79.8	36
Robinson et al. (2010)	Australia	RCT	22	ICBT	150	10	GAD-7	46.9 (12.70)	68.3	3
Théberge-Lapointe et al. (2015)	Canada	OT	29	VCBT	5	14	PSWQ	47.0 (7.48)	100	12
Titov et al. (2009)	Australia	RCT	21	ICBT	48	9	GAD-7	44.0 (12.98)	76.0	N/A

Abbreviations: AppCBT, application-based CBT; GAD-7, generalized anxiety disorder Scale (7-item); ICBT, internet administered CBT; NS, not stated (did not report statistics for overall sample); OT, open trial; PSWQ, Penn State Worry Questionnaire; RCT, randomized controlled trial; TCBT, telephone administered CBT; UK, United Kingdom; USA, United States of America; VCBT, videoconferencing administered CBT.

^aReported in Brenes et al. (2017).

^bExcludes data for condition that did not meet study inclusion criteria (e.g., transdiagnostic treatment arm).

17 (lowest quality study) to 34 (highest quality study) from a possible rating of 0 to 44. Interrater reliability was deemed to be excellent for study quality assessments (ICC = 0.94; 95% CI: 0.92–0.96).

3.3 | Between-group analyses

3.3.1 | Remote treatment versus control

A total of six studies (eight comparisons) compared a remote treatment to a waitlist control or non-CBT remote control group in a randomized controlled design. Seven of the eight comparisons (87.5%) were internet-delivered CBT interventions and 1/8 (12.5%) was a telephone-administered CBT intervention. Between-group analyses indicated a medium pooled effect size at posttreatment ($k = 7$; $g = 0.76$; 95% CI: 0.47–1.06) favoring the remote CBT treatments ($Q_7 = 27.79$, $p < 0.001$). Table 2 outlines the between-group effect sizes at posttreatment for each of the included studies. Heterogeneity was high across studies ($I^2 = 74.81$), suggesting significant variability in outcomes. The Trim and Fill procedure indicated no evidence of publication bias. The one study removed method also indicated no change to the effect size. Between-group analyses also indicated a medium effect size at follow-up ($k = 4$; $g = 0.52$; 95% CI: 0.18–0.86) with moderate levels of heterogeneity ($I^2 = 67.15$).

3.3.2 | Between-group moderator analyses

3.3.2.1 | Type of control group

The type of control group did not moderate treatment effects at posttreatment ($Q_1 = 3.73$, $p = 0.05$). However, at posttreatment effect size for waitlist controls were large ($k = 6$; $g = 0.92$; 95% confidence interval [CI]: 0.61–1.23; $I^2 = 70.56$), while effect sizes for non-CBT active controls were small ($k = 2$; $g = 0.31$; 95% CI: –0.22 to 0.84; $I^2 = 42.53$) and the CI crossed zero. Similarly, at follow-up the type of control group did not moderate treatment effects ($Q_1 = 0.06$, $p = 0.81$).

3.3.2.2 | Outcome measure

Outcome measure moderated between-group outcomes at posttreatment ($Q_1 = 4.74$, $p = .03$). At posttreatment effect sizes were significantly larger for the studies that utilized the GAD-7 ($k = 4$; $g = 1.05$; 95% CI: 0.68–1.43; $I^2 = 64.18$) compared to the small effects of the PSWQ ($k = 4$; $g = 0.46$; 95% CI: 0.07–0.84; $I^2 = 70.92$). Moderator analysis could not be conducted at follow up due to sample size.

3.3.2.3 | Country study conducted

The country of study origin moderated outcome ($Q_2 = 6.41$, $p = .04$). Between-group effect sizes at posttreatment were larger for Australian studies ($k = 3$; $g = 1.23$; 95% CI: 0.77–1.69; $I^2 = 0.00$), than those conducted within Europe ($k = 3$; $g = 0.44$; 95% CI: –0.01 to 0.90; $I^2 = 80.61$) and North America ($k = 1$; $g = 0.49$; 95% CI: 0.21–1.19; $I^2 = 0.00$). Moderator analyses for could not be conducted at follow-up due to small sample size.

3.3.2.4 | Study quality

Study quality was found to moderate between-group treatment effects at posttreatment ($Q_1 = 10.74$, $p = 0.001$) with higher quality studies producing lower effect sizes. Approximately 69% of the variance in the between-group treatment effects was explained by study quality. At follow-up study quality no longer moderated treatment outcome ($Q_1 = 3.72$, $p = 0.05$).

TABLE 2 Between-group effect sizes from pretreatment to posttreatment and pretreatment to follow-up

Study	Type of remote treatment	Type of control	Intensity	Pretreatment to posttreatment		Pretreatment to follow-up		Weight of study
				<i>g</i>	95% CI	<i>g</i>	95% CI	
Andersson et al. (2012)	ICBT	Waitlist	Low	0.13	-0.40 to 0.66	0.09	-0.43 to 0.62	20.09
		IPDT	Low	0.07	-0.45 to 0.60	0.41	-0.12 to 0.94	19.90
Brenes et al. (2015)	TCBT	TNDST	High	0.49	0.16-0.82	0.49	0.16-0.82	28.23
(Carl et al. (2020)	AppCBT	Waitlist	Low	0.68	0.43-0.93	0.89	0.63-1.14	31.78
Paxling et al. (2011)	ICBT	Waitlist	Low	1.04	0.60-1.48	-	-	-
Robinson et al. (2010)	ICBT (clinician)	Waitlist	Low	1.20	0.77-1.63	-	-	-
	ICBT (technician)	Waitlist	Low	1.27	0.83-1.70	-	-	-
Titov et al. (2009)	ICBT	Waitlist	Low	1.22	0.59-1.84	-	-	-
Overall				0.76	0.47-1.06	0.52	0.18-0.86	

Abbreviations: AppCBT, application-based CBT; CI, confidence interval; ICBT, internet administered CBT; IPDT, internet administered psychodynamic therapy; TCBT, telephone administered CBT; TNDST, telephone-delivered nondirective supportive therapy.

3.4 | Within-group analyses

3.4.1 | Overall within-group effect size for remote treatment

Table 3 outlines the within-group effect sizes for each of the included studies. The pooled within-group mean effect size was large across all remote treatments from pretreatment to posttreatment ($k = 11$; $g = 1.30$; 95% CI: 1.03–1.58). A high level of heterogeneity across studies was indicated ($I^2 = 89.69$). Using the Trim and Fill method three studies were trimmed, however, effect sizes remained large (adjusted $g = 1.15$; 95% CI: 0.89–1.41). Using the one study removed method effect sizes remained unchanged. From pretreatment to follow-up the pooled within-group effect size remained large across all remote treatments ($k = 9$; $g = 1.47$; 95% CI: 1.21–1.73). There were high levels of heterogeneity however ($I^2 = 83.57$). Using the Trim and Fill method two studies were trimmed, however effect sizes remained large (adjusted $g = 1.32$; 95% CI: 1.05–1.59). Using the one study removed method effect sizes remained unchanged.

3.4.2 | Within-group moderator analyses

3.4.2.5 | Treatment intensity

Treatment intensity did not moderate outcome ($Q_1 = 2.28$, $p = 0.13$). From pretreatment to posttreatment pooled within-group effect sizes were large for the low intensity (i.e., internet-delivered and application-based CBT) ($k = 9$; $g = 1.36$; 95% CI: 1.11–1.61; $I^2 = 85.15$) and high intensity (i.e., videoconferencing- and telephone-delivered CBT)

TABLE 3 Within-group effect sizes from pretreatment to posttreatment and pretreatment to follow-up

Study	Type of remote treatment	Intensity	Pretreatment to posttreatment		Weight of study	Pretreatment to follow-up		Weight of study
			g	95% CI		g	95% CI	
Andersson et al. (2012)	ICBT	Low	0.46	0.16–0.76	9.79	0.97	0.62–1.32	11.77
Brenes et al. (2015)	TCBT	High	0.46	0.20–0.71	10.13	1.46	1.12–1.81	11.77
Carl et al. (2020)	AppCBT	Low	1.40	1.22–1.59	10.53	1.69	1.48–1.90	13.56
Dear et al. (2015)	ICBT	Low	1.51	1.32–1.69	10.54	1.53	1.34–1.72	13.78
Hadjistavropoulos et al. (2014)	ICBT	Low	1.22	1.02–1.41	10.51	-	-	-
Miller et al. (2021)	AppCBT	Low	2.03	1.44–2.61	7.34	2.75	2.01–3.48	6.85
Paxling et al. (2011)	ICBT	Low	1.08	0.79–1.36	9.90	0.81	0.55–1.07	12.94
Robinson et al. (2010)	ICBT (clinician)	Low	1.51	1.19–1.83	9.61	1.42	1.11–1.73	12.28
	ICBT (technician)	Low	1.70	1.37–2.03	9.51	1.58	1.26–1.90	12.16
Théberge-Lapointe et al. (2015)	VCBT	High	2.11	0.96–3.26	3.74	1.68	0.71–2.65	4.89
Titov et al. (2009)	ICBT	Low	1.61	1.15–2.07	8.41	-	-	-
Overall			1.30	1.03–1.58		1.47	1.21–1.73	

Abbreviations: AppCBT, application-based CBT; CI, confidence interval; ICBT, internet administered CBT; TCBT, telephone administered CBT; VCBT, videoconferencing administered CBT.

treatments ($k = 2$; $g = 0.83$; 95% CI: 0.20–1.47; $I^2 = 86.83$). The results from pretreatment to follow-up were similar and treatment intensity did not moderate outcome ($Q_1 = 0.03$, $p = 0.85$) with large pooled within-group effect sizes for low intensity (i.e., internet-delivered and application-based CBT) ($k = 7$; $g = 1.46$; 95% CI: 1.16–1.76; $I^2 = 87.60$) and high intensity (i.e., videoconferencing- and telephone-delivered CBT) treatment ($k = 2$; $g = 1.53$; 95% CI: 0.86–2.20; $I^2 = 0.00$).

3.4.2.6 | Outcome measure

Outcome measure moderated treatment outcome ($Q_1 = 17.91$, $p < 0.01$). From pretreatment to posttreatment pooled within-group effect sizes were significantly larger for the studies that utilized the GAD-7 ($k = 7$; $g = 1.51$; 95% CI: 1.31–1.72; $I^2 = 52.43$) compared to the PSWQ ($k = 4$; $g = 0.74$; 95% CI: 0.45–1.04; $I^2 = 83.84$). Results were similar at follow-up ($Q_1 = 7.17$, $p < 0.01$) however, pooled within-group effect sizes were large for both the GAD-7 ($k = 5$; $g = 1.66$; 95% CI: 1.41–1.91; $I^2 = 66.36$) and the PSWQ ($k = 4$; $g = 1.12$; 95% CI: 0.81–1.42; $I^2 = 71.20$).

3.4.2.7 | Country study conducted

The country of study origin did not moderate within-group outcomes ($Q_2 = 3.05$, $p = 0.22$). Pretreatment to posttreatment pooled within-group effect sizes were large for Australian ($k = 4$; $g = 1.58$; 95% CI: 1.14–2.01; $I^2 = 0.00$), North American ($k = 3$; $g = 1.03$; 95% CI: 0.49–1.58; $I^2 = 92.31$), and European studies ($k = 3$; $g = 1.11$; 95% CI: 0.59–1.62; $I^2 = 91.69$). The results from pretreatment to follow-up were similar ($Q_2 = 0.58$, $p = 0.75$) with large pooled within-group effect sizes seen for Australian studies ($k = 3$; $g = 1.51$; 95% CI: 1.09–1.93; $I^2 = 0.00$), North American studies ($k = 2$; $g = 1.53$; 95% CI: 0.89–2.16; $I^2 = 0.00$), and European studies ($k = 3$; $g = 1.29$; 95% CI: 0.83–1.75; $I^2 = 91.56$).

3.4.2.8 | Study quality

Study quality did not moderate within-group treatment effects from pretreatment to posttreatment ($Q_1 = 2.86$, $p = 0.09$) or from pretreatment to follow-up ($Q_1 = 2.94$, $p = 0.08$).

4 | DISCUSSION

The aim of this study was to build on the existing literature of remote treatment for GAD by exploring the efficacy of remote CBT using a meta-analytic approach. Overall, the results indicate that remote CBT for GAD is an efficacious and promising treatment with large within-group effect sizes seen when all remote CBT treatments are pooled together ($g = 1.30$). This pooled effect size is within the same range as meta-analyses of face-to-face CBT for GAD, where large effect sizes ($g = 1.01$) have also been seen (Carpenter et al., 2018). Results are also consistent with other reviews in the field that have explored low intensity remote CBT for GAD (e.g., Andrews et al., 2018; Richards et al., 2015) and high intensity remote treatment for other anxiety disorders (e.g., Rees & Maclaine, 2015; Varker et al., 2019).

Both low and high intensity remote CBT treatments showed large within-group effect sizes from pretreatment to posttreatment ($g = 1.36$ and 0.83 , respectively) and pretreatment to follow-up ($g = 1.46$ and 1.53 , respectively), with no significant difference between the two levels of intensity. While this is the first study to compare low intensity and high intensity remote treatments for GAD, this finding is similar to those seen in other studies that have compared low intensity and high intensity treatments for other anxiety and related conditions (Efron & Wootton, 2021; Wootton, 2016). This finding has potential implications for the delivery of CBT for GAD. For instance, if both low and high intensity treatments are equally effective in the treatment of GAD, health providers may wish to implement a stepped-care approach to treatment where lower intensity (and more cost effective treatment) is offered as a first step before patients progress on to higher intensity (and more costly) treatments. Future research could explore the possibility of remote stepped-care treatment approaches for GAD.

Between-group analyses indicated a medium pooled effect size at posttreatment ($g = 0.76$) favoring the remote CBT treatments over controls (which included waitlist or non-CBT remote treatment). Study quality moderated between-group outcomes with higher quality studies producing smaller effect sizes. Further analyses revealed that the type of control group did not moderate study outcome, however those studies using non-CBT active controls had lower between-group effect size ($g = 0.33$) than those studies using nonactive waitlist control groups ($g = 0.98$). This finding indicates that while remote CBT may be more efficacious than no treatment, it may only be slightly better than other remote treatment approaches and more controlled trials are needed. It is noteworthy that, to date, little research has been conducted that directly compares high and low remote treatment approaches or remote CBT with traditional face-to-face treatment in GAD. As such, both types of approaches are important avenues for future research.

Findings also indicated that both within- and between-group outcomes were moderated by outcome measure used, with the GAD-7 demonstrating significantly larger effects than the PSWQ. These findings are similar to other studies that have shown the GAD-7 to be more sensitive to measuring changes in GAD symptoms (Dear et al., 2011). This holds important implications for both research methodology and clinical application, where the GAD-7 may offer more advantages in clinical work in demonstrating treatment effects. Future meta-analyses may wish to examine a consistent measure across studies to offer a more robust estimate of effect size.

The country of study origin also moderated treatment outcome in between-group comparisons, with the largest effects found in Australia, compared to North America and Europe. The reasons for differences in effects across regions are unknown, however, future research may wish to explore possible relationships between outcome and the treatment protocol used as well as previous participant exposure to CBT. It is also worth noting the diversity of treatment protocols used across studies in this field. Given the variability of content and ways in which information can be presented it is important to examine in future research how these differences may affect outcome. Similarly, while all studies included in the analyses have incorporated CBT interventions that have been identified as effective in face-to-face treatment, ongoing research may benefit from identifying CBT interventions that are most conducive to remote delivery.

4.1 | Research limitations

While this study has provided some useful preliminary findings and addressed gaps within the existing literature, some important methodological limitations should be noted. First, both controlled and uncontrolled trials were included in the analyses and as research in this field develops, a greater emphasis should be placed on controlled trials to evaluate the efficacy of remote treatments for GAD. Second, unpublished data in this area may exist which may alter the results of this study. Third, given the strict criteria for inclusion in this study (including the requirement for participants to be diagnosed with GAD via a diagnostic interview) the current analyses were based on only two high intensity studies, thus results should be considered preliminary, and replication is required as more studies emerge. Additional studies examining the efficacy of high intensity remote methods for GAD (such as telephone-delivered and videoconferencing-delivered CBT) are urgently needed. Such research would allow researchers to continue to compare low intensity and high intensity CBT for GAD and explore further potential moderators of treatment outcome. Fourth, the current study only included participants who were treated with a disorder specific protocol and future studies may wish to include transdiagnostic treatment approaches. Finally, while the current results are promising, the results should be interpreted with caution given high levels of heterogeneity in some instances, and the small number of studies available for moderator analyses.

4.2 | Clinical implications

The results of this meta-analysis provide important implications for service delivery of GAD treatment and stepped care models. Future research should consider each of the delivery modalities and how they fit within the landscape

of treatment. Treatment guidelines (e.g., NICE, 2011) currently discuss stepped care in terms of beginning with low intensity self-help modules before progressing to face-to-face CBT without considering the full spectrum of treatment delivery methods (e.g., high intensity remote treatment) and thus the possibility of an entirely remote stepped care model of treatment. Using a remote stepped care approach where CBT modalities for GAD are offered in escalating order of intensity would be beneficial in addressing barriers associated with treatment. Such a stepped care approach may start with remote low intensity interventions (such as internet-delivered or application-based CBT) and progress on to higher intensity interventions as needed (such as telephone or videoconference administered). Alternatively, matching disorder severity and preferences with appropriate treatment modes may result in reduced waiting times and potentially increase treatment adherence.

4.3 | Conclusion

Overall, the current meta-analysis provides preliminary results to indicate that both low and high intensity remote CBT treatments are effective in the treatment of GAD. Remotely delivered CBT is a viable option for individuals who are unable to access face-to-face treatment. These results play an important role in informing the optimal treatment delivery for individuals with GAD to improve accessibility and reduce economic burden and treatment wait times. The study also identified a clear direction for future research including the need for an increase in high quality studies examining the efficacy of high intensity remote treatment of GAD, as well as direct comparisons between high intensity remote treatment and traditional face-to-face treatment, and low-intensity and high-intensity remote treatments.

AUTHOR CONTRIBUTIONS

Bethany M. Wootton conceptualized the research idea. Vesna Basile performed the literature search and conducted the data analysis. Bethany M. Wootton completed the inter-rater reliability and checked all data with an independent analysis. Vesna Basile drafted the first version of the manuscript, and this was critically revised by Bethany M. Wootton and Toby Newton-John. All authors read and approved the final manuscript.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request. Deidentified data will be made available to other researchers upon reasonable request.

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