Braver together: an exploration into the effectiveness of blended group cognitive behavior therapy as early intervention for socially anxious adolescents

Velthuizen S.L.M.

Chapter 2

The Effectiveness of Supplemental and Replacement Blended Cognitive Behavioral Therapy for Internalizing Disorders: A Meta-Analysis

Based on:

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Abstract

Blended cognitive behavioral therapy (bCBT) combines the use of traditional in-clinic, face-to-face therapy sessions with online therapy platforms. The blended aspect can either be supplementary to face-to-face sessions, or a partial replacement of face-to-face sessions. While bCBT has been available for two decades, there is no statistically synthesized overview of its effectiveness in treating anxiety and depression, two of the most common psychological disorders. In this study we examined effectiveness in two meta-analyses: 1) comparing bCBT to treatment as usual; 2) comparing bCBT change scores from pre- to post-treatment. We tested the influence of moderators on effectiveness: blended method, online therapist contact, and diagnosis. In line with expectations, results from meta-analysis one (k = 19 studies, N = 2749) showed that supplementary bCBT leads to a significantly superior treatment effect over treatment as usual (*Cohen's d* = 0.41, 95% CI [0.24, 0.59]) while replacement bCBT is on par with treatment as usual (d = -0.01, 95% CI [-0.18, 0.17]). Meta-analysis two included 32 studies (N = 1895) and showed significant improvement with bCBT (*Morris's D* = 1.12, 95% CI [0.92, 1.33]), irrespective of blended method or therapist contact. Findings suggest that bCBT is a worthwhile form of treatment for both anxiety and depression.

Keywords

Blended CBT, Depression, Anxiety, Online Therapy, Replacement, Supplemental, Meta-Analysis

Introduction

A new method for the treatment of internalizing disorders has emerged in recent decades: *blended care.* This method combines the traditional use of in-clinic, face-to-face (F2F) therapy sessions with using more recently developed online therapy platforms. Among the different methods of blended care that have evolved, blended cognitive behavioral therapy (bCBT) is a common one. Although bCBT to treat internalizing disorders has been studied for more than 20 years, no study to date has statistically synthesized information regarding the efficacy of bCBT. Therefore, to close this gap, this meta-analysis investigates the extent of symptom improvement brought about by bCBT, and to what extent bCBT is an effective treatment method compared to treatment as usual (TAU). The timing of this meta-analysis is highly relevant owing to the increased practice of a hybrid working and living model as a result from the COVID-19 pandemic, which forced both clinics and governmental institutions to look at internet-delivered treatment models with new light. Many psychologists, while perhaps previously skeptical about the use of online treatment platforms or hybrid forms of treatment, became apt at incorporating technology into their treatments (Stefan et al., 2021). This is likely to lead more therapists to look for ways of incorporating hybrid methods into clinical practice. In short, there is a compelling need to evaluate whether bCBT is effective.

bCBT consists of regular, in-clinic face-to-face sessions with a licensed therapist in combination with access to an online therapy resource, such as the internet, email, or a smartphone (mobile therapy apps are generally referred to as *mHealth).* The practice of combining support provided in person with an online therapy platform has been described as "the best of both worlds" (Wentzel, et al., 2016, pp.1). It is possible to imagine the benefits of a blended care method: "[r]ather than reducing therapeutic alliance, mobile interventions would allow providers to extend the reach of therapy beyond the walls of the clinic when clients are likely in need of more support" (Berry & Lai, 2014, pp.63). Thus, rather than constituting an entirely new form of therapy, it could perhaps add to and enhance the already existing ingredients of therapy. For example, homework is a common feature of cognitive behavior therapy (Hudson & Kendall, 2002; Pereira et al., 2016). As proposed by Stoll and colleagues (2017), there could be several advantages to using a blended approach to homework tasks, for example through an mHealth app. Patients could review strategies when needed, receive reminders and notifications of tasks, and receive feedback on their tasks without the need to meet up with their therapist. Additionally, the authors proposed it would open the possibility for a fun-factor in the shape of in-app games.

Knowles et al. (2014) conducted a qualitative meta-synthesis on user experiences of computerized therapy and reported that a blended format allows for a level of empowerment and anonymity perceived as beneficial. They also mention flexibility, which is seen as an advantage for many patients, although it can also become a downfall as it requires some level of self-discipline. However, as mentioned in Stoll et al. (2017) this downside can be countered by allowing both patient and therapist to track personalized intervention goals and schedules. Pramana et al. (2014) reason that mHealth modules allow for increased opportunity for communication between client and therapist; and for an element of constant accessibility when it is most needed: one can gain support and review strategies right before or in the middle of a difficult situation.

When implementing bCBT, it has one of two goals: i) to cut treatment costs by replacing some in-clinic, F2F sessions by work on an online therapy platform; or ii) to boost the effectiveness of treatment by adding an online therapy platform on top of regular in-clinic, F2F sessions. Thus, bCBT can be divided into two classifications, aligned with the aforementioned aims. In the first classification, the blended element is used as a partial *replacement* of regular, in-clinic face-to-face sessions. This could for example mean that in the course of 12 weeks, a client attends a total of 6 biweekly face-to-face CBT sessions, and practices at home in the intervening weeks using an online CBT platform. This type of blended care has the aim of saving the therapist (and sometimes also the client) time by substituting the F2F sessions with online therapy tasks and thus working towards a more cost-effective method of therapy as demonstrated in previous studies (e.g., Kooistra et al., 2019; Langergaard et al., 2022; Romijn et al., 2021). Studies that include this type of blended care aim to establish bCBT as equally effective to regular, in-clinic face-to-face sessions.

In the second type of bCBT, the blended element is used as an additional component *supplemental* to regular face-to-face therapy sessions. In practice, this could mean a client attends 12 weekly in-clinic, F2F therapy sessions and, in addition to these sessions, spends time at home practicing on an online therapy platform each week. Therefore, the aim is to add to the effectiveness of the therapy (e.g., Berger et al., 2018), or else to improve a secondary outcome (e.g., lower attrition, stronger alliance; Vernmark et al., 2018). Studies that report on this type of blended care aim to show its effectiveness as superior to that of regular face-to-face sessions (e.g., Pérez et al., 2021).

The effectiveness of blended care in treating internalizing disorders was examined in a systematic review by Erbe at al. (2017). The authors concluded that bCBT shows promise: blended therapy methods can be both cost-effective, and possibly have higher and longer lasting effectiveness than a non-blended counterpart (Erbe et al., 2017). However, in that review several characteristics of blended care were not differentiated.

For example, Erbe and colleagues did not look exclusively for blended treatment using CBT but included other schools of therapy as well. Therefore, the effectiveness of blended CBT specifically is still unknown. Moreover, they studied the effectiveness of blended care in treating anxiety, depression and substance abuse, though the effectiveness was not differentiated by disorder. More relevant to the current study, Erbe et al. (2017) did not make the distinction between replacement and supplemental types of blended care. The authors differentiated between *sequential* blended interventions, in which patients receive internet-based intervention before or after F2F treatment, e.g., as part of a stepped care program; and *integrated* blended interventions, in which patients receive both F2F and an internet-based intervention within the same timeframe. However, this distinction does not capture the different goals (cost-effectiveness versus treatment improvement) that may be served by offering an online intervention. Hence, the current study aims to shed light on the impact of these two goals of blended care by examining the effectiveness of the two blended methods separately, using a meta-analysis approach.

Previous research has yielded contradictory findings regarding the effectiveness of bCBT, even within one type of bCBT. Some researchers have consistently found high effect sizes in their replacement bCBT group (e.g., Sethi et al., 2010; Sethi, 2013). Other studies found the replacement bCBT treatment group had null or even marginally lower improvement scores than their TAU group, though also a small cost-saving benefit (e.g., Langergaard et al., 2022). Similar inconsistencies have been reported for supplementary bCBT; for example, Schuster et al. (2020) reported high effect sizes whereas Kenter et al. (2015) reported small to moderate effect sizes. The discrepant results indicate that effectiveness of bCBT may depend on several factors, suggesting potential moderating effects. In the following paragraphs we discuss online therapist contact and type of internalizing disorder (anxiety or depression).

Several researchers in the bCBT field have proposed that the possibility to have online contact with the therapist through the online therapy platform has beneficial effects on treatment outcome (e.g., Palmqvist et al., 2007). Mathiasen and colleagues (2022) noted that increased therapist contact during the online parts of bCBT can be a protective factor and lead to lower dropout rates. However, these are propositions and not actual findings. To steer our expectations on what the effect of online therapist contact may be, we look to studies on therapist contact among iCBT studies. Findings from studies in the guided iCBT field are in line with suggestions made in the bCBT field. Guided iCBT consists of internet-delivered therapy in which the patient works through online therapy modules, often at their own pace, with the feedback from a professional, delivered asynchronously via email or a secure in-platform messaging system, or else directly via telephone. The most important distinction with bCBT is that in guided

iCBT, there are no in-clinic, F2F sessions (live video calling is occasionally used, such as in Nordh et al. (2021). Spek and colleagues (2007) conducted a meta-analysis to investigate the effectiveness of iCBT for anxiety and depression, and they found studies with therapist support had a much larger pooled effect size than studies without (*Cohen's d* = 1 vs. 0.26, respectively). In a more recent meta-analysis, Linde and colleagues (2015) showed that online therapist contact during iCBT leads to more effective treatment. Thus, it is not yet clear what role the availability of therapist contact may have in bCBT but findings from iCBT suggest it may be beneficial.

Previous bCBT studies have shown positive outcomes for both anxiety and depression (e.g., Sethi et al., 2010). In their meta-analysis, Spek and colleagues (2007) differentiated between iCBT studies treating depression versus anxiety. They found a small effect size in depression studies (d = 0.32) and a large effect in anxiety studies (d = 0.96). Spek et al. (2007) attributed this result to the presence of online therapist rather than type of symptomatology: "it is not so much the type of problem (symptoms of depression or anxiety) that differentiates between large and small effect sizes but rather the distinction between whether [online therapist] support is added or not." (pp. 327). Therefore, in this meta-analysis, we will investigate whether degree of effectiveness of bCBT is related to anxiety and depression as well as online therapist contact.

Present Study

In this study, we investigated to what extent bCBT is an effective treatment method for anxiety and depression in youth and adults and compare its effectiveness to treatment as usual. We aimed to answer two main research questions: i) is bCBT more effective than treatment as usual (TAU)? and ii) what factors are related to moderation of change scores? To answer the first research question, whether bCBT is more effective than regular therapy, we conducted a meta-analysis comparing the post-test scores of RCT (randomized controlled trials) studies that include bCBT as their experimental group and TAU as their control group. This allowed us to compare how bCBT performs against an active control group (treatment as usual) that receives treatment from established protocols shown to be effective (e.g., CBT, ACT). It was expected that bCBT would be more effective than TAU.

To answer the second research question related to moderation of change scores, we looked at within-subject change in symptom scores from pre-test to post-test within groups receiving bCBT. Hence, in this meta-analysis we were able to include a broad representation of effectiveness studies: encompassing both single-armed effectiveness studies and RCTs with varying types of control groups. Analysis on improvement scores within treatment is an adequate way to calculate a true effect (Bandelow & Wedekind, 2022), and can include peer-reviewed single-armed studies (Strawbridge et al., 2019).

In their meta-analysis on iCBT to treat anxiety and depression, Etzelmueller and colleagues (2020) reasoned that effectiveness studies may show slightly smaller effect sizes than often rigorously structured RCTs but nevertheless offer a more valid representation of clinical practice. Focusing on the change in the pre- and post-test scores within the bCBT group allowed us to include studies that were underrepresented among RCTs, such as studies with younger populations. This meta-analysis method has also been used by other researchers who wished to be all-encompassing in their inclusion (e.g., Feiss et al., 2019). We expected bCBT to be an effective treatment with a significant improvement between pre- and post-test.

Moderating Variables

Within both meta-analyses, we tested for the influence of moderating variables. We expected type of blended method (supplemental bCBT versus replacement bCBT) to be related to different effect sizes. As supplemental bCBT has been designed to enhance effectiveness, we expected it to yield larger effect sizes than replacement bCBT. Second, having the option of online therapist contact on the online therapy platform was expected to show larger effect sizes than no opportunity for online therapist contact. Finally, we tested the influence of type of internalizing disorder (anxiety and depression). It was expected that bCBT would be similarly effective for anxiety and depression.

Method

We refer to the participants of all studies as patients; while some participants may not have been recruited directly from clinics, they were all undergoing clinical treatment. This meta-analysis was not preregistered; a protocol was not prepared.

Eligibility Criteria

Studies on using blended CBT to treat anxiety or depression were included. To meet the criteria of disorder, anxiety and/or depression had to be the main target population, with depression and/or anxiety level as an outcome measure. We defined blended therapy as programs that used face-to-face sessions and an online format. More specifically, studies had to have a combination of both face-to-face sessions and an online therapy element, as well as be a form of treatment. Protocols that used an online format only (e.g., iCBT) were not eligible. To meet the criteria of CBT, studies applied CBT methods either in the F2F sessions, in the online therapy platform, or in both. Studies had to be published in English and empirical. We included populations of all ages, and a primary outcome measure of depression and/or anxiety was required. To be included in the meta-analysis on RCTs only, studies were required to have a control group that received treatment, referred to as either treatment as usual or as standard face-to-face

CBT without a focus on a blended element. As such, RCTs with waitlist control groups were included in the second meta-analysis but not in the first.

The following exclusion criteria were applied to the full text of eligible studies: anxiety or depression was not the primary clinical diagnosis (e.g. patients with schizophrenia as the primary diagnosis, anxiety in cancer survivors, patients with PTSD, patients with adjustment disorder with anxiety, mothers or fathers with post-natal depression); reviews and protocols; absence of a clinical outcome measure (e.g., articles which examined rapport between client and therapist but not at level of anxiety). Duplicates within the search were removed. No studies were excluded because of publication year; all included studies were published between 2006 and 2023.

Study Identification

The literature search was conducted using Web of Science, Web of Science UK, PubMed, PsycINFO, MEDLINE, and The Cochrane Library. The literature search was conducted by SV on May 15, 2023 and updated on March 20, 2025. The search terms used were split into three main categories: disorder, CBT, and blended care. These three categories were combined with AND in the search to ensure all three were represented in the abstract or title (Table S1). Both British and American spelling was used. The search terms were applied to the title and/or abstract of the study. No automation tools were used. Additional relevant studies found via the references of the included studies were also included.

Data Extraction

Information relevant for the meta-analysis and risk of bias assessment, including study characteristics (e.g. sample size, average age and age range, outcome sources used, and treatment as usual procedure) and outcome information (pre- and post-test means and standard deviations) was extracted by SV (see Table S2 and Table S3). Follow-up data was also extracted though it was not included in this meta-analysis. Data was extracted and coded in Excel. The primary clinical outcome measure as determined in each article was used. Outcome measures included Clinician's Severity Ratings, symptom self-report instruments, and quality of life measures. When a study met the eligibility criteria, but the necessary data was not available, authors were contacted. Initially, the first author of a publication was contacted by email and reminders were sent when necessary. When this did not prompt a response, the last author was contacted and reminded if necessary. We received the requested data from one of the five contacted studies.

Moderating Variables

Blended method. Treatment protocols' blended CBT method was categorized dichotomously as supplemental or replacement. Protocols that offered patients access to an online treatment platform in addition to regular, often weekly, F2F therapy sessions were coded as supplemental bCBT. Studies that substituted the regular, weekly, F2F therapy sessions with therapy work on an online treatment platform in a systematic fashion (e.g., F2F therapy sessions every two weeks, alternated with online therapy work), were coded as replacement bCBT. In one instance, there was doubt as to in which category the protocol belonged. The authors were contacted for protocol clarification and advice (Månsson et al., 2013).

Opportunity for online therapist contact. Online therapist contact was coded into a binary "yes" or "no." In order to meet the criteria for "yes, online therapist contact," studies had to utilize some form of therapist contact via the online therapy platform defined as: i) a direct chat function with the therapist and the rest of the treatment group; ii) an asynchronous message function directly with the therapist; or iii) the possibility for the therapist to enter personalized feedback after the completion of therapy work on the online therapy platform. If a study did not meet any of these criteria, it was coded as not having online therapist contact. Studies in which the online therapy platform sent automatic reminders to patients to complete their homework were considered as having "no contact."

Disorder. Most studies focused on either depression or anxiety as the primary diagnosis of the population. However, some studies had both anxiety and depression as the primary diagnosis within their study population. This could mean that they studied two separate populations or that they had one population with both anxiety and depression as primary diagnoses, and thus two primary outcome measures. When both anxiety and depression were mentioned as a study's population's primary outcome measure, the effect sizes of the outcomes of both disorders were included. However, if it was clear that one disorder was the primary outcome measure and the other disorder was a secondary outcome measure but not the main diagnosis, only the effect size of the main diagnosis was included.

Quality Assessment

For randomized controlled trial studies, the revised Risk of Bias tool 2 was employed (RoB 2.0; Sterne et al., 2019). For non-randomized studies, the Risk of Bias in Non-randomized Studies - of Interventions (ROBINS-I; Sterne et al., 2016) was used. Both tools evaluate the risk of bias on different domains (e.g. confounding variables, selection of participants, missing data), providing a comprehensive appraisal on the design and integrity of the included studies. Each domain was rated on three criteria: low risk

of bias, some concerns of bias and high risk of bias. Two graduate students completing their research master's in Psychology received thorough training in the Cochrane Risk of Bias tools by author ML. They independently evaluated the included studies. In addition to the students, author ML also rated all of the included studies for both meta-analyses. Discussions on discrepancies were resolved with authors ML and SV.

For the risk of bias assessment of the RCT studies, we deviated in two domains from the tool's recommendations: RCTs included in the current analysis involved participants' awareness of their group allocation (domain 2. 1) and participants were their own outcome assessors (domain 4.2). Since this was inevitable due to the nature of the intervention, this potential bias is expected to be similar across all studies.

Data Analysis

All analyses in this study were conducted in RStudio version 4.3.1 (RStudio Team, 2023) using the 'meta' package (version 6.5-0; Balduzzi et al., 2019), and the 'metafor' package (version 4.2-0; Viechtbauer, 2010). Random-effects model was chosen for its ability to handle heterogeneity in effect across studies, assuming a normal distribution of effects (Deeks et al., 2024). Outlier and influential cases were investigated. The I^2 statistic was used to quantify between-study heterogeneity, interpreted as the percentage of total variability due to between study heterogeneity (not caused by sampling error). Tau squared was used as an estimator of between-study variance. Both the 95% confidence and 95% prediction intervals are reported. To obtain the 95% prediction interval, we calculated the lower and upper bounds based on the mean effect size for the random effects model. This was adjusted by adding (for upper bounds) or subtracting (for lower bounds) the Z-value multiplied by the square root of the sum of the between-study variance (tau squared) and the squared standard error of the effect size estimate. The dataset was studied using a leave-one-out analysis and the Interquartile Range (IQR) method was employed to identify outliers.

Meta-Analysis 1: Effectiveness of bCBT Compared to TAU

To answer the first research question regarding the efficacy of bCBT compared to TAU, only RCTs with TAU or CBT control groups were included. A standardized mean difference (SMD) calculation of the effect size was run comparing the post-test (T2) scores of bCBT versus TAU. Effect size was calculated using Cohen's *d*. Cohen's *d* is an effect size measure that accounts for small sample sizes, thus, with some caution, we can interpret 0.2 as a small effect, 0.5 as moderate, and 0.8 as large (Cohen, 1988). A positive effect size indicates favor of bCBT over TAU. In meta-analysis 1, the bCBT group was considered the experimental group and the TAU group the control group. In studies with two overlapping experimental groups (reporting on a population with

both anxiety and depression), we split the experimental and control group in half to avoid weighing participants twice (Higgins et al., 2024).

Meta-Analysis 2: Change Scores

To answer the second research question regarding moderation of change scores, a meta-analysis was conducted on the difference between the pre- and post-test. Here, all RCTs included in the previous meta-analysis were included, along with additional studies in the form of RCTs with waitlist controls and single-arm effectiveness studies without control groups. The effect size of the change score was calculated using Morris's D and analyzed using a random effects model (REM). Morris's D is similar to Cohen's D, though it differs in the crucial aspect that it assumes the variability between the scores is not constant and thus takes the correlation between pre- and post-test scores into account (Morris & DeShon, 2002). Since we did not have access to the raw data of each participant, it was not possible to calculate the correlation between pre- and post-test time points. Therefore, as recommended by Cuijpers (2016) a correlation of 0.7 was assumed[1]. A positive effect size indicated an improvement in scores as a result of bCBT treatment.

Moderating Variables

To investigate to what extent the variation in effect sizes can be explained by methodological and sample factors, moderation analyses were performed on the three categorical moderator variables: 1) type of blended method (replacement bCBT vs. supplemental bCBT); 2) online therapist contact (yes vs. no); and 3) disorder (anxiety vs. depression).

Publication Bias

To study small biases effects, funnel plots were inspected and an Egger's regression test was conducted to assess the asymmetry for both meta-analyses. Moreover, the Duval and Tweedie Trim-and-Fill Method (Duval & Tweedie, 2000) was used to examine the magnitude of publication bias.

Results

Selected Studies

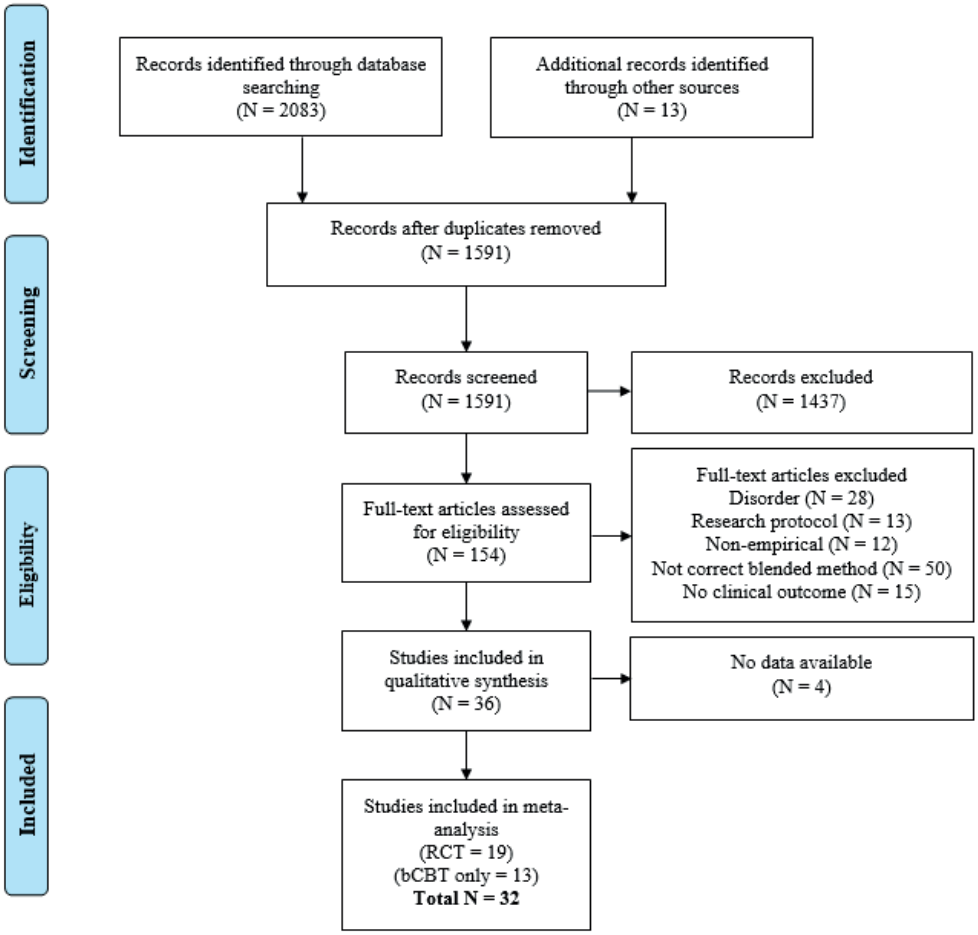
Figure 1 is a flowchart, according to the PRISMA guidelines (Moher et al., 2009), presenting the selection of studies for this meta-analysis. The literature search yielded 2083 studies. After duplicates had been removed, we screened 1591 studies and an additional

1 A sensitivity analysis assuming a correlation of 0.5 showed similar results.

13 studies were identified via the references of included articles. Four studies potentially met the eligibility criteria but could not be included due to unavailable data (Ebert et al., 2013; Hronis et al., 2019; Kooistra et al., 2020; Wright et al., 2005) and one study due to the sample already being represented in another publication (Langergaard et al., 2022 presented in Mathiasen et al., 2022). Nineteen studies comparing bCBT to TAU in an RCT were included, along with 13 studies that were either single-arm, waitlist control, or non-randomized control. A total of 32 studies were included. Extracted raw data can be found in Table S2. Datafiles and syntax used in the analyses can be made available upon request.

Figure 1

Literature Search Diagram



Note. PRISMA flow diagram (Source: Moher et al., 2009).

Study Quality

We carried out the RoB 2.0 on all RCTs, regardless of type of control group, and the ROBINS-I on all non-randomized studies. Among the RCTs, overall, the risk of bias was between low and moderate in most papers (Figure S1). Most concerns for a moderate bias were caused by lack of information on the randomization procedure and baseline differences between groups. Only two studies were potentially at risk for high biases on subdomains involving selective reporting on outcome measures or involving lack of information on post-treatment assessors. Out of these two, only one had an overall high risk of bias. All single-arm studies assessed using the ROBINS-I tool had a moderate overall risk of bias (Figure S2). Most concerns regarded the bias due to possible confounding effects and bias in reporting measurement of outcomes. This was most likely driven by the fact that the single arm studies involved small-sampled, pilot studies that did not allow for thorough testing of confounding effects, used convenient recruitment strategies, or did not have testing bCBT effectiveness as their primary goal.

Moderation Analysis of Study Quality. Using the portion of RCTs included in meta-analysis 1, we assessed whether study quality found in the RoB 2.0 moderated the effect of treatment in this meta-analysis. Because there was only one overall high risk of bias study, it was combined with studies with some risk, so as to make a binary variable of "low" risk versus "some to high" risk. There was a moderating effect of risk of bias among the meta-analysis 1 studies (Q = 124.24, df = 21, p = <.001). Studies with some to high risk of bias had higher effect sizes (θ = 0.25; p = .044) than studies with low risk of bias (θ = 0.05; p = .647). Supplemental and replacement studies were proportionally represented in each category. It was not possible to conduct a moderation analysis on the studies assessed using the ROBINS-I tool because there was not enough variation. All studies assessed with the ROBINS-I tool had moderate risk, except one which was high. A sensitivity analysis was run to assess the influence of this study.

It was not possible to conduct a moderation analysis on all studies included in meta-analysis 2 because the results from the RoB 2.0 and the ROBINS-I are not directly comparable, and so they should not be combined. However, we did check whether effect sizes from studies from meta-analysis 1 (RCTs with a TAU control group) and studies added to meta-analysis 2 (with a waitlist control group or no control) were different. There was no significant difference: t(24.72) = 1.79, p = .085.

Meta-Analysis 1: Effectiveness of bCBT Compared to TAU

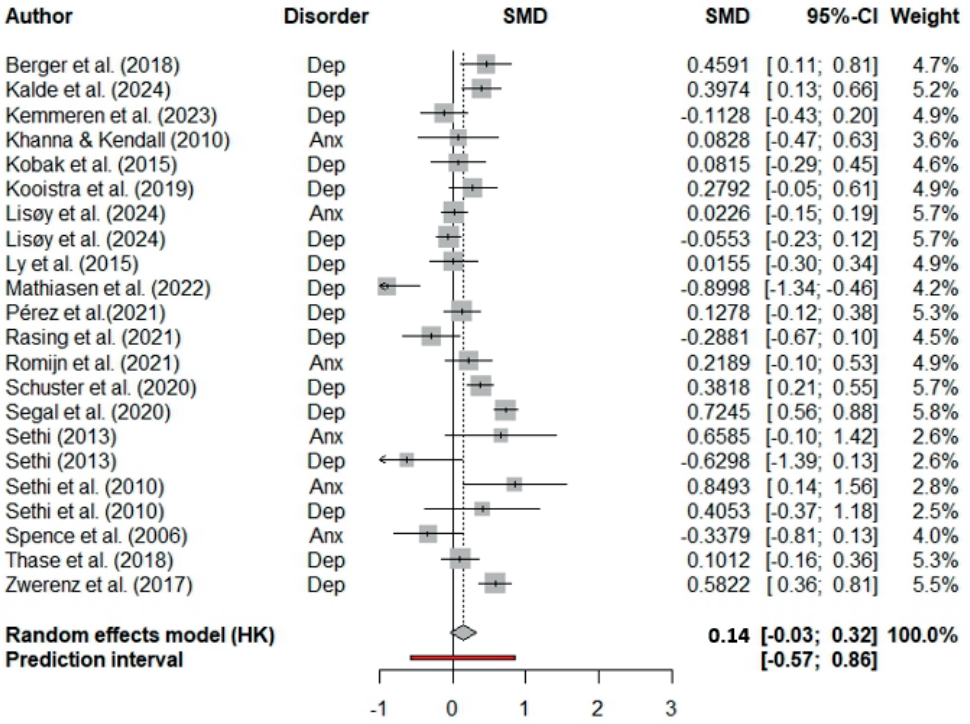
There was no difference in mean pre-test score on the primary outcome measure between the bCBT and TAU groups (t(41.79) = 0.07, p = .944), indicating no significant difference between the two groups before treatment. A random effects meta-analysis (k = 19 studies, *effect sizes* = 22; N = 2749) was conducted on the mean

post-test scores resulting in a small combined effect size of 0.14 (95% CI [0.06, 0.39], p = .103; prediction interval = -0.031 – 0.32), plotted in Figure 2. This indicates that patients in the bCBT group had similar outcomes compared to patients in the TAU group. As a considerable I^2 value of 83.1% was observed (Q = 124.24, p = < .001), we further explored the variability due to between-study heterogeneity through moderation analyses.

Figure 2

Meta-Analysis 1: bCBT Compared to TAU

Forest Plot of Overall Effect Size, Direction in Favor of bCBT over TAU



Note. Disorder = disorder used as main outcome measure, SMD = standardized mean difference, SE = standard error, CI = confidence interval

bCBT Compared to TAU: Moderation Analyses

See Table 1 for the results of the individual subgroup analyses from meta-analysis 1. While it has previously been recommended to have at least four effect sizes per categorical subgroup (Fu et al., 2011), Deeks et al. (2024) are more cautious and recommend at least ten effect sizes for meaningful interpretation. In meta-analysis 1 subgroups are not distributed in a manner resulting in at least ten effect sizes per subgroup and therefore results should be interpreted with caution. It was not possible to conduct a moderation analysis on disorder because nearly all studies with anxiety disorder groups used the replacement method of bCBT.

There was a significant difference between replacement bCBT and supplemental bCBT (Q = 10.61; df = 1; p = .001; I^2 = 71.41%). The supplemental approach was associated with higher effect sizes and a superior treatment effect to TAU (d = 0.41, 95% CI [0.24, 0.59, p = < 0.001). The non-significant effect of replacement over TAU indicates that it is similarly effective as TAU (d = -0.01, 95% CI [-0.18, 0.17], p = 0.922). Online therapist contact was not a significant moderator (Q = 0.21; df = 1; p = .649; I^2 = 84.49%), indicating a similar effect with or without online therapist contact.

Table 1

Meta-Analysis 1: bCBT Compared to TAU

		k	*N at T2*	*SMD*	*95% CI*	*P value*	I^2
Main effect							
Meta analysis of bCBT vs. TAU		22	2749	0.14	-0.03 – 0.32	0.103	83.1%
Moderating Variables							
Blended method							
	Supplemental	7	1420	0.41	0.24 – 0.59	< 0.001	73.17%
	Replacement	15	1329	-0.01	-0.19 – 0.17	0.922	73.21%
Therapist contact							
	Contact	8	979	0.12	-0.04 – 0.27	0.136	54.22%
	No contact	14	1770	0.17	-0.09 –0.43	0.191	89.84%
Disorder							
	Anxiety	6	503	0.15	-0.11 – 0.42	0.256	58.51%
	Depression	16	2246	0.13	-0.07 – 0.33	0.193	87.37%

Note. k = number of effect sizes, N = number of participants at post-test, SMD = standardized mean difference, CI = confidence interval, I^2 = total heterogeneity.

bCBT Compared to TAU: Sample Bias

To check for small sample publication bias in the dataset analyzing only the effectiveness of bCBT compared to TAU among RCTs, we ran Egger's regression to test the asymmetry in the funnel plot (Figure S3). This was non-significant, indicating no statistical evidence for funnel plot asymmetry (t = 0.86; p = .398). Considering the significant heterogeneity among the studies, the Trim-and-Fill method was applied. This did not result in any missing studies being identified. Hence, the effect size was not corrected.

Both the leave-one-out method and outlier analysis using the IQR method revealed that there was one outlier: Mathiasen et al. (2022). Removing this low effect size from the analysis yielded an overall effect of 0.19 (95% CI [0.04, 0.34], p = .014; prediction interval = -0.34 – 0.73) with an I^2 value of 79.8%. There was no obvious methodological or other reason why this study yielded such a low effect size.

Meta-Analysis 2: Change Scores

Meta-analysis 2 (see Figure 3; effect sizes = 36; N = 1895) showed a significant improvement within the bCBT arm from pre- to post-test with a large effect size of 1.12 (*Morris's D*; 95% CI [0.92, 1.33], p = <.001, 95% prediction interval = 0.02 – 2.23). There was also considerable heterogeneity (I^2 = 90.56%, Table 2).

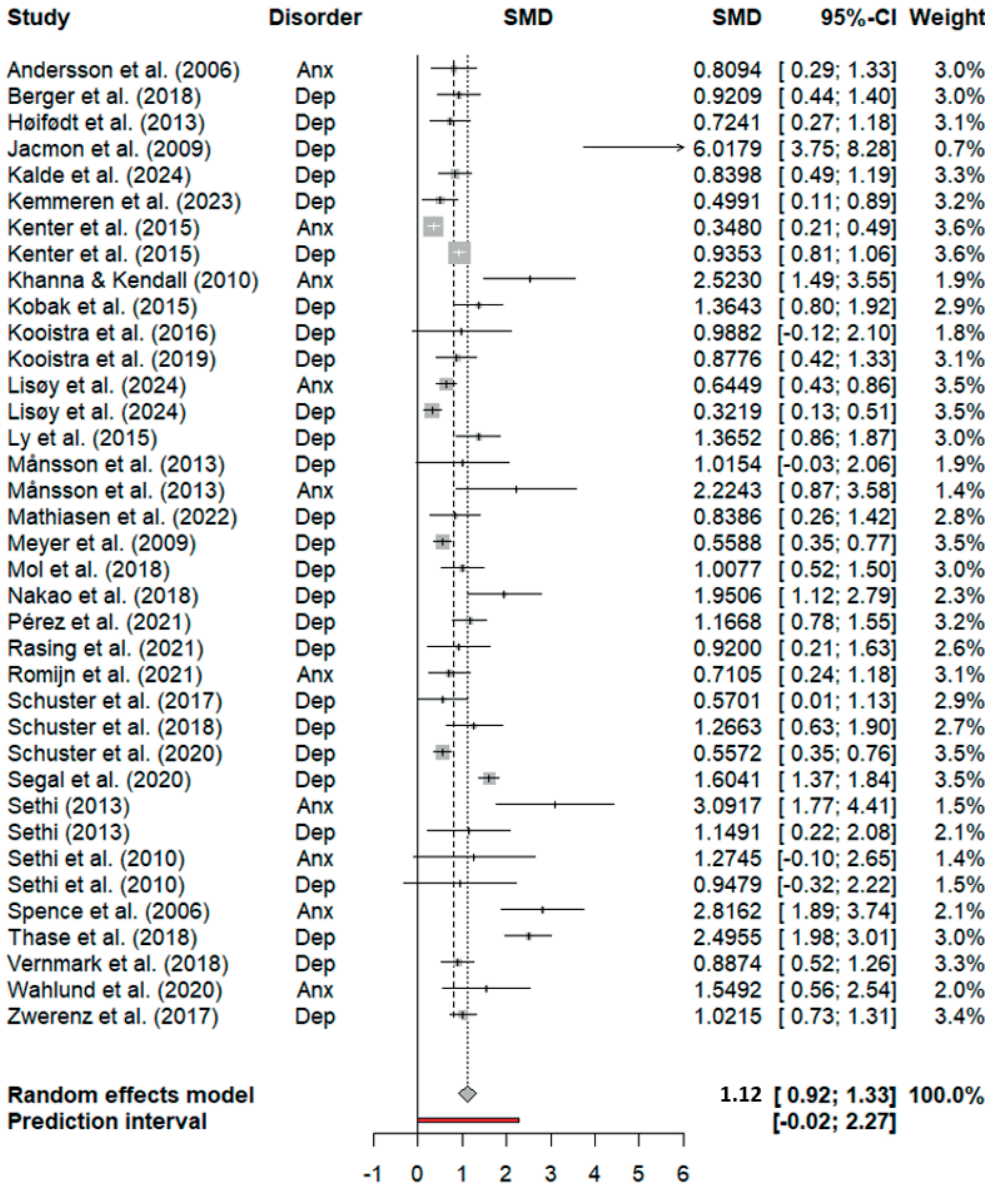
Change Scores: Moderation Analyses

See Table 2 for the moderation analysis results from meta-analysis 2. In meta-analysis 2, all subgroups contained at least ten studies per subgroup. Moderation analysis revealed that type of blended method was not a significant predictor (Q = 0.96; df = 1; p = .327; I^2 = 90.48%). Moderation analysis showed that there was no significant difference between studies which had the option of online therapist contact versus those which did not (Q = 1.33; df = 1; p = .250; I^2 = 89.93%). Type of disorder did not have a moderating effect on improvement (Q = 1.33; df = 1; p = .248; I^2 = 90.28%); bCBT was similarly effective for populations with anxiety as with depression.

Figure 3

Meta-Analysis 2: Change score from pre-test to post-test within bCBT

Forest plot of overall effect size, Showing a Large Effect within bCBT



Note. SMD = standardized mean difference, SE = standard error, CI = confidence interval.

Table 2

Meta-Analysis 2: Change Scores of Pre- to Post-Test within bCBT

		k	*N at T2*	*SMD*	*95% CI*	*P value*	I^2
Main effect							
Meta-analysis of improvement scores		37	1895	1.12	0.92 – 1.33	<.001	90.56%
Moderating variables							
Blended method							
	Supplemental	14	973	0.97	0.73 – 1.21	<.001	89.21%
	Replacement	23	984	1.04	0.84 – 1.23	<.001	85.84%
Online therapist contact							
	Contact	20	849	0.93	0.75– 1.10	<.001	72.88%
	No contact	17	1108	1.30	0.91 – 1.69	<.001	93.63%
Disorder							
	Anxiety	10	391	1.48	0.85 – 2.10	<.001	94.37%
	Depression	27	1566	1.04	0.84 – 1.23	<.001	85.84%

Note. Comparing difference in pre- post-test scores in bCBT arm (RCTs and single-arm studies). Effect size: Morris's D. k = number of effect sizes, N = number of participants at post-test, SMD = standardized mean difference, CI = confidence interval, I^2 = total heterogeneity

Change Scores: Sample Bias

To check for small sample publication bias among all studies, the symmetry in a funnel plot was tested (Figure S4). There is a chance of publication bias among the studies (0.47, 95% CI [0.23, 0.70], t = 3.66, p = .001). Therefore, the Trim-and-Fill method was employed to estimate the magnitude of the bias. However, no studies were filled, and so no corrected effect size was given. This could be due to a low number of true effect sizes, or due to large heterogeneity.

The study by Jacmon et al. (2010) yielded a high-critical bias score using the ROBINS-I tool. As such, a sensitivity analysis was run excluding this study which yielded an effect size of 1.08 (95% CI [0.88, 1.27]; p = <.001). A total of five outliers were identified, reflected in both the leave-one-out method and the IQR method (Jacmon et al., 2010; Khanna & Kendall, 2010; Sethi 2013 – anxiety and depression; Spence et al., 2006). Removing these from the analysis yielded an effect size of 0.90 (95% CI [0.75, 1.05], p = <.001, 95% prediction interval = 0.26 – 1.54) with an I^2 value of 78.49%.

Discussion

In this study we investigated the effectiveness of bCBT for anxiety and depressive disorders in two ways: i) by comparing group differences between bCBT and TAU (meta-analysis 1); and ii) by testing the extent to which symptom scores improve from pre- to post-treatment (meta-analysis 2). Moderating variables were explored in both meta-analyses. Overall, we found a high effect size for bCBT suggesting that bCBT is an effective treatment method. In meta-analysis 1, in relation to group comparison, a small effect was observed, the significance of which depended on whether or not one study reporting an extremely low effect size was excluded. The low effect size for group comparison is in line with our expectations, since bCBT was compared to TAU, which is assumed to be an effective form of treatment by itself. These results are discussed in detail below.

In line with our expectations, effectiveness did significantly differ between supplemental and replacement bCBT but only in comparison with TAU (meta-analysis 1). Supplemental bCBT yielded larger differences in effect size compared to TAU whereas replacement bCBT was similarly effective to TAU. There was no difference in effectiveness observed in pre- and post-test scores in meta-analysis 2. The greater effect size for supplemental in meta-analysis 1 suggests that each method is aligned with their goals: replacement bCBT is offered with the aim to reduce the number of F2F sessions, while maintaining effectiveness in comparison to TAU (Kooistra et al., 2019), whereas supplemental bCBT is offered with the explicit aim to increase effectiveness (Berger et al., 2018).

The effectiveness of bCBT was not moderated by diagnosis or online therapist contact, although the former could only be tested for improvement from pre-test to post-test. The non-significant difference between type of disorder is in line with our expectations (Sethi et al., 2010; Spek et al. 2007) and indicates that bCBT can be effective for both anxious and depressed populations.

Having an opportunity for online therapist contact did not moderate the effectiveness of bCBT compared to TAU, or the effectiveness of pre- to post-test scores within bCBT. This lack of effect of online therapist contact could be due to three potential reasons. First, having the option of therapist contact does not intrinsically equate to usage. It was not possible to study usage of online therapist contact as this was rarely reported. Second, therapist contact online may not be of high enough quality to be of consequence. Research into iCBT by Klein et al. (2009) found that the frequency of online therapist contact made no difference in the effectiveness of iCBT for treating panic disorder. This might suggest that therapist contact held online does not make much

difference, whereas the amount of F2F time might still be an important consideration and remains an area to explore within blended care. It can further be hypothesized that the therapeutic quality of the contact had online is perhaps lower than that in a F2F setting, but that this may not have an impact on the overall rapport as long as it is strong in F2F settings. Mathiasen and colleagues (2022) also noted this effect: "[t]he working alliance between the patient and clinician has often been argued to be one of the most important nonspecific factors of psychotherapy (…). It is, therefore, very interesting that although half of the sessions in B-CBT were computerized, the therapeutic alliance was rated equally well in both groups" (p. 14). The high effect size found from pre- to post-test within replacement bCBT studies included in this meta-analysis might suggest that they had good rapport during F2F sessions.

Third, our meta-analysis includes a heterogeneous sample with varying degrees and methods of online therapy use and contact, which may dilute any potential effect. There is an overall lack of report on treatment fidelity. In the current sample it was also not possible to make an overall assessment of quality of online support, communication or rapport, or how this may have affected treatment effectiveness. Future studies are recommended to report on treatment fidelity but also on actual utilization of online therapy platform and therapist contact. Furthermore, this should be investigated in relation with F2F contact and the quality of each. More clarity on the effect of format of online platform is also needed. For example, Watts et al. (2013) found similar effectiveness of internet-only CBT when delivered via smartphone app versus via computer in a small study though this needs to be replicated using a blended format with a larger sample size.

The risk of bias of most included studies was low to some risk, and only two included studies had a potential high risk of bias. Most risk indication was due to lacking information, such as on the randomization procedure or on baseline differences between groups. Thus, the studies may have been of higher quality but a lack of detailed reporting makes this uncertain. However, this finding is concerning as it could be due to these studies having less rigorous scientific procedures, thus allowing for more bias to happen (e.g., ambiguity surrounding who conducted post-test assessments). In future research, it is crucial that all relevant information is reported (e.g., report reasons for dropout) and that appropriate procedures are followed (e.g., account for missing data in analysis). Moreover, there may be some general issues with the bias assessment instruments used for this type of research. While the risk of bias tools (RoB 2.0 and ROBINS-I) utilized in this study are commonly used in our field, they may not be entirely suitable for studies on effectiveness of psychotherapy, as psychotherapy studies naturally have built-in flaws according to these tools: for example, they favor participants and therapists being blind to treatment condition when this is seldom achievable in psychotherapy. While

we made some concessions for these issues, in general, the results of the risk of bias assessments are likely to show a more conservative picture than is actually the case, and so these should be regarded as such.

Limitations

In order to study the potential effects of moderators, studies were grouped into dichotomous categories. However, there may be more nuances that were not possible to represent in this sample. For example, the variable online therapist communication was categorized as a dichotomous yes or no when, really, it had further variations within it with some studies applying therapist communication in the form of therapist feedback or emails, which are both asynchronous. Other studies, on the other hand, also had a chat option and, if used in that way, can be a form of direct communication. This was not possible to represent within this sample, primarily because each study varied in their combination of using therapist feedback, email, chat, or some other method of online communication, and so it was not possible to categorize it in a meaningful way.

Another example where this study lacks nuance is within the control groups. Control groups consisting of regular face-to-face CBT and of treatment as usual were included in meta-analysis 1. However, a great limitation of this study, and of the field, is the underreporting on what the control treatment consisted of. While some studies present a clear protocol, far too many studies called it 'treatment as usual' without actually describing what this entails. At times, these studies reported that CBT was one of the options within the treatment as usual but did not report to what frequency CBT was used over another form of therapy. We recommend future studies more accurately and transparently report the nature of their control groups.

There was further variation within the study populations. While some studies recruited their sample meeting clinical levels of the disorder from the general public, others admitted only already diagnosed patients from a clinic. This possible variation in degree of severity can also have a further influence on results, and future studies should examine to what extent degree of severity influences the suitability of a blended format. Differences in patient age were also noted, with populations ranging from children to adults. Although patient age has been proposed as a possible moderator of the effectiveness of bCBT (Mathiasen et al., 2022), it has not yet been extensively investigated. Therapists seem apt at creating age-appropriate online content to suit their audience (e.g., using graphical illustrations and animations (Kobak et al., 2015). The limited research available suggests age may be a factor in the extent to which internet interventions are used though it may not directly influence effectiveness (Fuhr et al., 2018; Hobbs et al., 2017; Schneider et al., 2018). It is not advised to study age as a moderator in meta-analyses

since mean age represents only a summary of a potentially larger variance within the sample (Deeks et al., 2024), thus it was not included here.

Different bCBT studies utilize different types of outcome measures to collect their primary outcome data. Examples include symptom-specific self-report measures which focus only on the disorder at hand (anxiety or depression), global health measures which include general questions of wellbeing reaching beyond the diagnosis (e.g., functioning in the workplace, physical health, etc.) and can be done by either self-report or clinician-rated; or clinician-reported scores derived from clinical instruments (e.g., a semi-structured diagnostic interview). Studies using clinician-rated severity or global health measures were underrepresented in our sample hence it was not possible to observe if there is a moderating effect of outcome measure. However, it is noteworthy that choice of source of outcome measure could affect the magnitude of results. This should be taken into account in future meta-analyses studying treatment effects.

Within the score of this analysis, it was not deemed feasible to also include follow-up data presented in most of the studies for the following reasons: i) the timing of the follow-up measurement differed greatly between studies; ii) the frequently large interval between post-test and follow-up means that participants may have sought additional support elsewhere in the intervening time, or other external factors may have influenced the situation, hence studies are not comparable; and iii) dropouts become more prominent at follow-up points and this complicates the analysis process. However, this is a limitation in studying the effect of treatment, as there may be effects of treatment which only take substantial effect in the months following treatment (the so-called 'sleeper effects'). Excluding this data from the analysis means that we now lack the knowledge of what could happen in the time following end of treatment, in which it could be argued that both bCBT and TAU could show even greater effects. Unfortunately, this wasn't feasible to include for the aforementioned reasons though it does mean there may actually be greater effectiveness not demonstrated in this analysis. Lastly, this study was not pre-registered.

Recommendations

Although our findings indicate that bCBT is effective, its effectiveness may be influenced by some factors that could not be included in this meta-analysis but which require further attention. One example is the extent to which patients actually make use of the at-home online therapy platform. Some studies did not report any information on this topic (e.g., Sethi et al., 2010) while many reported perceived feasibility scores and patient satisfaction but no actual usage data (e.g., Kobak et al., 2015; Meyer et al., 2009). Reports from the remaining studies were in incompatible formats, ranging from frequency of logging in (e.g., Pérez et al., 2021) and minutes spent on the

platform (e.g., Berger et al., 2018; Spence et al., 2006) to therapist time spent in the back-end system (e.g., Ly et al., 2015). It was therefore not possible to analyze to what extent use of online therapy platforms plays a role in effectiveness of blended treatment. Interestingly, while Fuhr et al. (2018) and Schneider et al. (2018) found that use of and adherence to internet-delivered interventions was positively related to age, Kenter et al. (2015) found that blended care was more frequently offered to younger populations. This could mean that therapists expect that young people will be more susceptible to or adhere better to care partially delivered online, while this is not necessarily the case. To identify best practices, future studies would benefit from consistent reporting of both quantitative usage data and subjective evaluations.

In addition, future studies should focus on what therapeutic components are chosen to be moved online on the online therapy platform. One could postulate that replacement bCBT protocols may need to transfer some of the more crucial therapeutic elements to the online platform (e.g., psychoeducation, cognitive restructuring), whereas supplemental bCBT can use it for more peripheral elements (e.g., relaxation techniques, mood diary). Moreover, future studies should report on how integrated the online therapy tasks are in the overall treatment and F2F sessions. In both replacement and supplemental bCBT studies, therapists themselves decided to what extent to involve the online therapy work in the F2F sessions (e.g., Berger et al., 2018; Mathiasen et al., 2022). Therapists in the study by Thase et al. (2018) on the other hand, reviewed patients' online work and incorporated their answers into the F2F sessions during the first half of the therapy duration. This variation suggests further efforts are needed to understand the field of bCBT.

In addition to effectiveness, there are a number of interesting potential secondary benefits to bCBT which were not possible to integrate in the present study. For example, Kobak et al. (2015) found higher alliance in their bCBT group than in their TAU group. This needs to be investigated further, as it could be that the option to communicate with the therapist online has other benefits beyond effect size, such as high therapeutic alliance, treatment adherence, and attendance, or lower attrition.

For some studies included in these meta-analyses, it is likely some research centers implemented a bCBT protocol into a clinic for the first time. Indeed, the technical know-how and level of comfort with technical solutions should be examined as deeply among therapists as among patients. Drummond et al. (2009) argued for a "learning curve" among professionals when implementing devices and technology in medical treatments. It should therefore be assumed that subsequent treatment groups may have higher effect sizes as therapists become more comfortable with the use of an online therapy platform. If therapists can focus only on giving high quality care in F2F settings

as they're used to, rather than balancing this with implementing new technologies, they may be able to give higher quality care. However, this is merely a contemplation and requires further scientific exploration.

Is bCBT the Future?

In sum, this study presents, for the first time, a meta-analysis of the effectiveness of a relatively new and appealing form of treatment for internalizing disorders: bCBT. The results of this study tentatively point to favorable outcomes for choosing bCBT over standard treatment. To further establish our understanding of the effectiveness of bCBT and its potential, we need to understand the perceived quality of the remote therapist communication, when present. In addition, we need to know more about the actual usage of the online therapist platform. Nevertheless, given the drastic change in living and working routines following the COVID-19 outbreaks and subsequent lockdowns, but also with tech-savvy generations, it is expected that more clinicians and researchers will be intrigued by the opportunities and benefits a blended therapy format can offer. Indeed, one of the studies included in the present meta-analysis already made an online psychoeducation platform available to their TAU group (Zwerenz et al., 2019). This suggests that bCBT is a promising therapy form and may be on its way to becoming "standard" therapy.

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Supplemental Figures and Tables Chapter 2

Figure S1

Overall and Subdomain Ratings for the Risk of Bias for Randomized Controlled Trials using RoB 2.0.

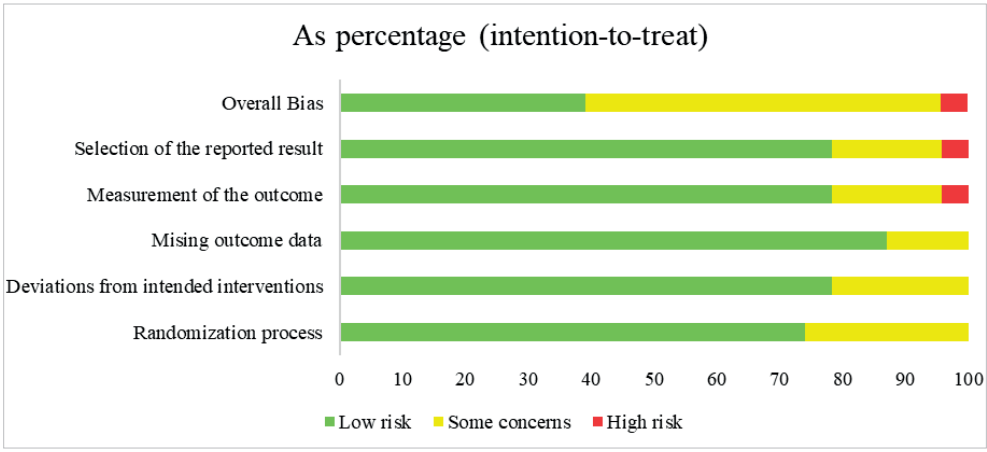

Figure S2

Overall and Subdomain Ratings for the Risk of Bias for non-Randomized Controlled Trials using ROBIN-I.

Study	Bias due to confounding	Bias in selection of participants into the study	Bias in classification of interventions	Bias due to deviations from intended interventions	Bias due to missing data	Bias in measurement of outcomes	Bias in selection of the reported result	Overall Bias
Kooistra et al., 2016	NI	Low	Low	Low	Low	Moderate	Low	Moderate
Wahlund et al., 2020	Moderate	Low	Low	Low	Low	Moderate	Low	Moderate
Mansson et al., 2013	Moderate	Moderate	Moderate	Low	Low	Moderate	Low	Moderate
Mol et al., 2018	Moderate	Low	Moderate	Low	Low	Moderate	Low	Moderate
Schuster et al., 2018	Moderate	Low	Low	Low	Low	Moderate	Low	Moderate
Kenter et al., 2015	Moderate	Moderate	Low	Low	Moderate	Low	Low	Moderate
Venmark et al., 2018	Moderate	Low	Low	Low	Low	Moderate	Low	Moderate
Jacmon et al., 2010	Serious	Moderate	Low	Low	Serious	Serious	Serious	Serious

Figure S3

Meta-Analysis 1: bCBT Compared to TAU

Publication bias funnel plot

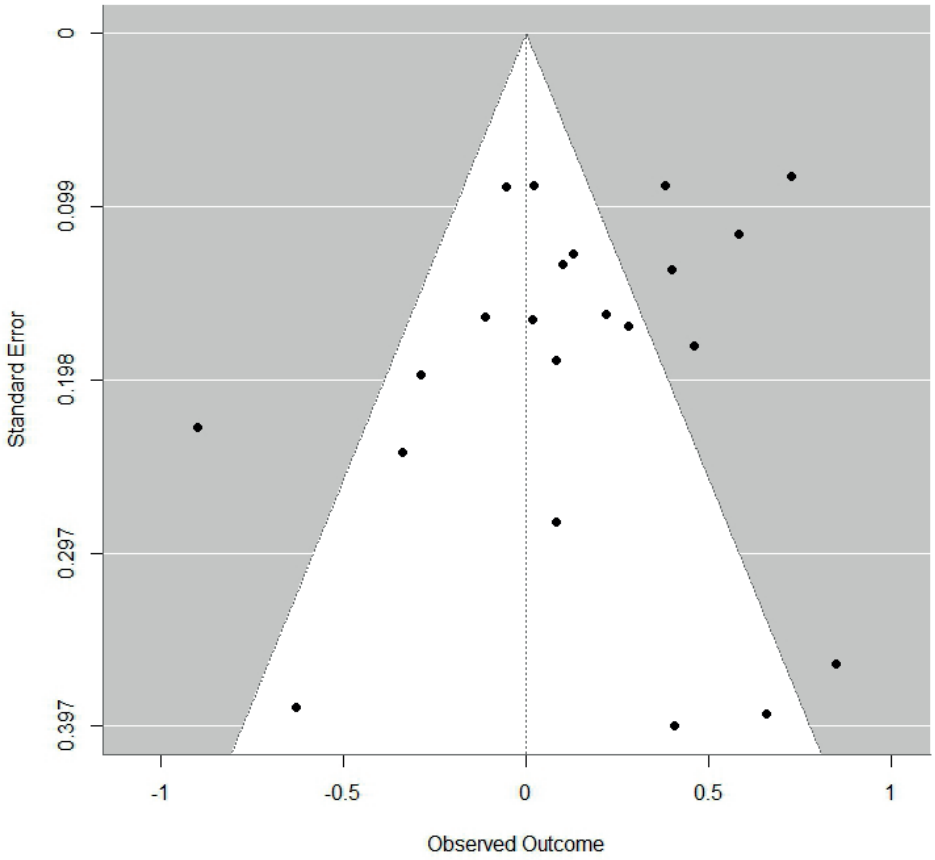

Figure S4

Meta-Analysis 2: Change Score from Pre- to Post-Test within bCBT

Publication bias funnel plot

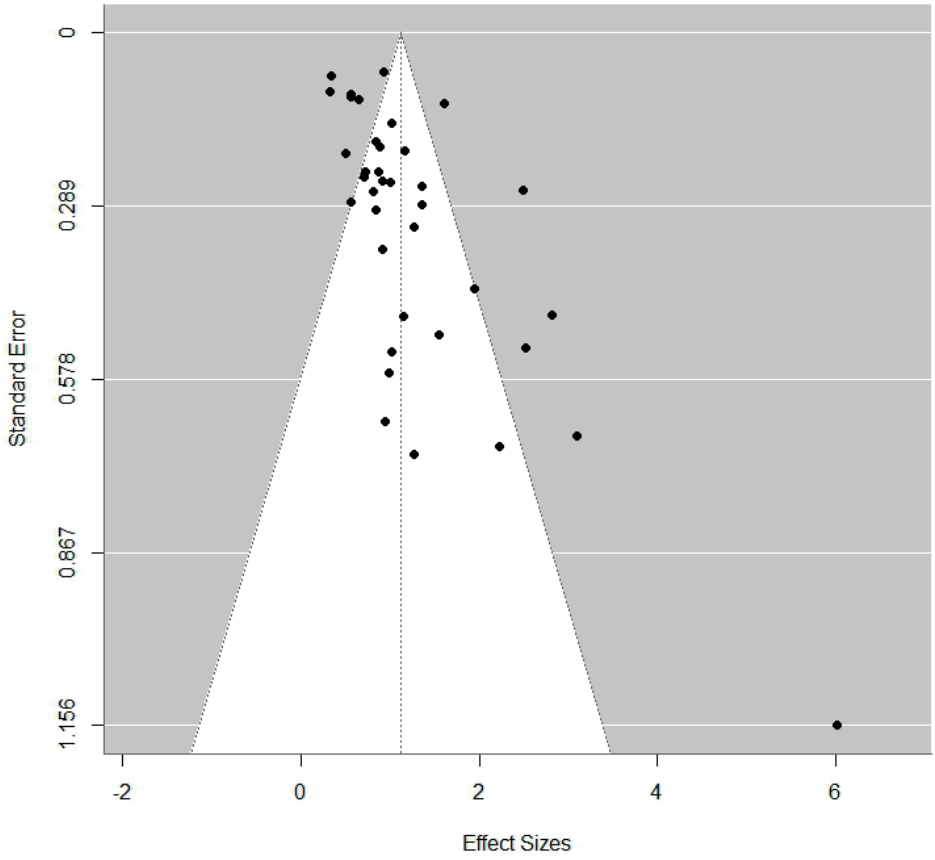

Table S1

Literature Search Terms

Disorder	Anxiety or anxiety disorder or anxiety disorders or phobia or phobias or depression or depressive or MDD or major depressive disorder or internalizing disorder or internalizing disorders				
	AND				
CBT	CBT or cognitive behavioural therapy or cognitive behavioral therapy or cognitive behaviour therapy or cognitive behavior therapy or cognitive behavioural treatment or cognitive behavioral treatment or cognitive behaviour treatment or cognitive behavior treatment				
	AND				
Blended care	Face-to-face or in-session or clinic or outpatient or blended or adjunction or supplementary	**AND**	Web or online or internet or app or e-health or ehealth or m-health or mhealth or iCBT or bCBT or blended or supplementary or adjunction	**AND**	Therapy or treatment or intervention or care

Table S2

Extracted Means and Standard Deviations

RCTs													
		bCBT						TAU					
		Pre-test			Post-test			Pre-test			Post-test		
Authors	**Disorder**	***N***	***M***	***SD***	***N***	***M***	***SD***	***N***	***M***	***SD***	***N***	***M***	***SD***
Berger et al. (2018)	Depression	51	29,6	8,4	37	19,9	12,3	47	30,2	11,2	32	25,6	12,2
Kalde et al. (2024)	Depression	77	26,79	10,24	66	16,06	9,67	77	25,16	7,61	66	18,16	9,8
Kemmeren et al. (2023)	Depression	53	16,1	5,6	42	12,6	6,9	50	16,6	5,6	41	12,4	6,6
Khanna & Kendall (2010)	Anxiety	16	5,7	0,87	16	2,9	1,0	17	5,8	1,2	16	3,1	1,6
Kobak et al. (2015)	Depression	39	14,66	3,56	35	8,57	4,98	37	14,43	2,99	30	8,7	5,36
Kooistra et al. (2019)	Depression	53	45,2	12,1	41	31,9	12,7	49	41,5	11,6	35	32	17,5
Lisøy et al. (2024)	Anxiety	151	71,55	14,82	151	59,68	17,66	166	68,02	14,28	166	57,06	16,75
	Depression	150	11,84	5,87	150	9,49	6,35	166	11,25	4,98	166	8,55	7,95
Ly et al. (2015)	Depression	46	28,96	8,07	44	15,17	11,51	47	27,32	7,89	46	13,68	10,68
Mathiasen et al. (2022)	Depression	38	14,42	4,25	28	9,93	4,87	38	16,05	0,63	34	7,71	7,0
Pérez et al. (2021)	Depression	84	27,27	8,67	68	14,65	11,36	83	25,0	8,65	71	13,62	9,87
Rasing et al. (2021)	Depression	39	25,94	6,07	17	18,83	10,85	36	26,58	9,45	24	16,43	13,79
Romijn et al. (2021)	Anxiety	51	27,9	12,02	34	17,18	10,28	62	27,15	11,67	43	18,93	11,55
Schuster et al. (2020)	Depression	166	10,51	3,84	166	7,85	3,72	174	10,24	3,85	174	9,0	3,46
Segal et al. (2020)	Depression	230	7,2	1,41	230	4,39	3,07	230	7,29	1,53	230	6,48	4,09
Sethi et al. (2010)	Anxiety	5	11,3	4,1	5	3,7	1,5	5	12,2	5,9	5	8,0	3,2
	Depression	5	18,2	10,3	5	4,0	1,7	5	19,0	5,1	5	7,2	3,1
Sethi (2013)	Anxiety	11	22,09	3,87	22	6,81	3	11	23,33	6,46	11	10,85	2,57
	Depression	11	18,81	6,89	22	8,54	3,15	11	21,42	6,8	11	7,8	3,09
Spence et al. (2006)	Anxiety	27	5,81	0,96	22	2,34	2,2	22	6,0	1,02	20	2,0	2,34

Table S2 Continued

RCTs

		bCBT						TAU					
		Pre-test			Post-test			Pre-test			Post-test		
Authors	**Disorder**	***N***	***M***	***SD***	***N***	***M***	***SD***	***N***	***M***	***SD***	***N***	***M***	***SD***
Thase et al. (2018)	Depression	77	19,8	3,5	64	8,9	5,6	77	19,6	3,8	62	9,2	6,3
Zwerenz et al. (2019)	Depression	108	30,63	9,39	108	18,69	10,38	107	29,46	9,5	107	23,34	10,66

Single-arm studies

		bCBT					
		Pre-test			Post-test		
Authors	**Disorder**	***N***	***M***	***SD***	***N***	***M***	***SD***
Andersson et al. (2006)	Anxiety	32	68,5	22,5	30	45,6	25,1
Hoifodt et al. (2013)	Depression	52	21,37	6,85	37	15,15	8,15
Jacmon et al. (2010)	Depression	9	25.78	2.49	6	5,0	3.2
Kenter et al. (2015)	Anxiety	99	59,0	5,3	99	64,1	9,4
	Depression	69	54,6	4,8	69	60,2	9,0
Kooistra et al. (2016)	Depression	9	40,44	12,87	7	23,25	14,73
Meyer et al. (2009)	Depression	320	26,72	9,86	159	19,87	11,85
Mol et al. (2018)	Depression	38	15,8	3,8	38	11,0	6,0
Månsson et al. (2013)	Anxiety	8	18,07	7,7	8	7,67	4,2
	Depression	8	21,2	4,1	8	9,07	5,7
Nakao et al. (2018)	Depression	20	18,3	3,6	20	9,4	5,1
Schuster et al. (2017)	Depression	22	22,0	5,41	22	18,1	5,82
Schuster et al. (2018)	Depression	26	24,58	6,51	26	14,19	6,73
Vernmark et al. (2018)	Depression	73	14.29	5.11	62	8.63	5.77
Wahlund et al. (2020)	Anxiety	12	33,8	6,0	12	21,8	7,8

Note. Disorder = disorder used as main outcome measure, N = Sample size as analyzed, M = Means, SD = Standard deviations. Data presented here is rounded to two decimal points.

Table S3

Study Characteristics

RCTs: bCBT vs. TAU

Authors	Country	Blended method	Disorder	Online therapist contact	Blended method	TAU Control	Outcome instrument	Average age	Age range
Berger et al. (2018)	Germany	Supplemental	Depression	No	12 weeks of F2F TAU with Deprexis (online CBT therapy program)	Usually weekly one-hours psychotherapy sessions, number of sessions determined by therapist.	BDI-II (1)	43,1	19-73
Kalde et al. (2024)	Germany	Supplemental	Depression	No	12 weeks of F2F TAU CBT with Elona therapy (online CBT therapy program)	12 weeks of CBT TAU.	BDI-II (1)	32,33	18-65
Kemmeren et al. (2023)	The Netherlands	Replacement	Depression	Yes	Total 19-20 weeks: 10 F2F sessions supplemented by 9 asynchronous sessions on mobile application Moodbuster.	Following national guidelines: evidence based F2F psychotherapy (CBT, IPT or PST). Sometimes also including antidepressants.	PHQ-9 (1)	39,3	Not stated
Khanna & Kendall (2010)	U.S.	Replacement	Anxiety	No	12 sessions of computerized CBT (in 6 of these there is therapist contact), 2 F2F parenting sessions	12 weeks of weekly 50-min individual CBT sessions (adjusted version of Coping Cat program).	ADIS-P (3)	10,1	7-13
Kobak et al. (2015)	U.S.	Supplemental	Depression	Yes	12 weeks of F2F CBT sessions plus individualized text messages throughout the week. Review of messages with therapist in session.	12 weeks of TAU.	QIDS-A-Pat (1)	15,4	12-17
Kooistra et al. (2019)	The Netherlands	Replacement	Depression	Yes	10 F2F sessions plus 9 online sessions. Aimed for 1one F2F session, 1 online session, and 1 online feedback message per week.	Treatment could vary per patient; however, on average 18 sessions over 20 weeks, standard F2F CBT sessions.	IDS-SR30 (2)	38,8	Not stated

Table S3 Continued

RCTs: bCBT vs. TAU

Authors	Country	Blended method	Disorder	Online therapist contact	Blended method	TAU Control	Outcome instrument	Average age	Age range
Lisøy et al. (2024)	Norway	Replacement	Anxiety	No	8 weekly 45-60 min sessions in group forma plus 8 weekly automated web-based sessions. Each digital sessions took 10-30 min to complete.	16 twice-weekly 45-60 min sessions in group format (3-7 children per group).	MASC-C (1)	10.6	8-12
			Depression				SMFQ-C (1)		
Ly et al. (2015)	Sweden	Replacement	Depression	Yes	4 F2F behavioral activation sessions in 9 weeks; smartphone-based therapy app with encouraging messages from therapist in a one-way communication channel.	10 F2F behavioral activation treatment, over a period of 10 weeks.	BDI-II (1)	30,6	18-73
Mathiasen et al. (2022)	Denmark	Replacement	Depression	No	Alternating 6 F2F CBT sessions with 6-8 online CBT self-help modules from program NoDep. Automatic reminders from therapist.	12 F2F CBT sessions, over a period of about 12 weeks. The same treatment protocol in both groups.	PHQ-9 (1)	35	18-71
Pérez et al. (2021)	Chile	Supplemental	Depression	Yes	Access to online therapy platform ASCENS, offering therapist feedback and online consultations, in addition to regular care (which included antidepressants for 100% of sample) for 9 months.	Treatment given in accordance with national guidelines; can include antidepressants.	BDI (1)	39,31	18-64

Table S3 Continued

RCTs: bCBT vs. TAU

Authors	Country	Blended method	Disorder	Online therapist contact	Blended method	TAU Control	Outcome instrument	Average age	Age range
Rasing et al. (2021)	The Netherlands	Replacement	Depression	Yes	45 min sessions with a therapist (with a minimum of five and maximum of 15 sessions), the rest online. Chat function within online platform. Parents received 2 F2F psychoeducation sessions.	15 weekly 45-min F2F CBT sessions.	CDI-2 (1)	16,6	13-22
Romijn et al. (2021)	The Netherlands	Replacement	Anxiety	Yes	15 weekly, alternating F2F sessions and online sessions in Minddistrict with asynchronous feedback.	15 weekly F2F CBT sessions based on national guidelines. Similar to bCBT protocol.	BAI (1)	36,3	
Schuster et al. (2020)	Germany	Supplemental	Depression	Yes	12 weeks standard CBT with access to Deprexis, weekly asynchronous feedback from therapist.	TAU based on national guidelines (evidence-based treatments including CBT, PDT and, for a small percentage, systemic therapy).	PHQ-9 (1)	43,3	19-65
Segal et al. (2020)	U.S.	Supplemental	Depression	No	12 weeks of TAU with 8 sessions on an online platform; CBT with a focus on mindfulness. Regularly contacted by a coach for motivation in a one-way communication.	TAU followed national guidelines. Patients had access to individual or group therapy and, depending on severity levels, antidepressants.	PHQ-9 (1)	48,3	Not stated
Sethi et al. (2010)	Australia	Replacement	Anxiety	No	3 sessions over the span of 3 weeks. First ½ hour in F2F CBT followed directly by ½ hour client working in MoodGYM at their own pace.	3 F2F CBT sessions, over a period of 3 weeks.	DASS-21 (1)	19,47	18-23
			Depression				DASS-21 (1)	19,47	

Table S3 Continued

RCTs: bCBT vs. TAU

Authors	Country	Blended method	Disorder	Online therapist contact	Blended method	TAU Control	Outcome instrument	Average age	Age range
Sethi (2013)	Australia	Replacement	Anxiety	No	5 weeks of 5 sessions. First ½ hour in F2F CBT followed directly by ½ hour client working in MoodGYM at their own pace.	F2F CBT sessions with focus on anxiety and/or depression.	DASS-21 (1)	20,08	18-25
			Depression				DASS-21 (1)	20,08	
Spence et al. (2006)	Australia	Replacement	Anxiety	No	For the children: 5 F2F 60 min sessions, alternating with 5 60 min online sessions. For the parents: 3 60 min F2F sessions, 3 online sessions. The 3-month booster sessions were both delivered online.	For the children: 10 F2F child group CBT sessions of 60 min. For the parents: 6 F2F parent group CBT sessions of 60 min. Booster sessions at 1 and 3 months.	ADIS-P (3)	9,93	7-14
Thase et al. (2018)	U.S.	Replacement	Depression	No	12 F2F therapy sessions; first session 50 min long, following sessions 25 min long, 9 internet-delivered sessions of 25 min.	20 F2F CBT sessions of 50 min, twice weekly in the first 4 weeks, then weekly for 12 weeks. Total duration 16 weeks.	HAM-D (1)	46,3	Not stated
Zwerenz et al. (2019)	Germany	Supplemental	Depression	No	12 weeks of TAU (group or individual, different schools of therapy) F2F sessions plus access to 10 modules of CBT-based online platform Deprexis.	TAU with treatment sessions and access to an online psychoedua-tion platform, in accordance with national guidelines.	BDI-II (1)	47,98	18-65

Table S3 Continued

Single-armed: bCBT only									
Authors	**Country**	**Blended method**	**Disorder**	**Online therapist contact**	**Blended method**	**Control**	**Outcome instrument**	**Average age**	**Age range**
Andersson et al. (2006)	Sweden	Replacement	Anxiety	Yes	2 x 3-hour group exposure sessions plus online CBT assignments, patients were required to submit answers in essay format which were reviewed by therapist within 24h before patient could move on. Also required to post message in a discussion forum.	Waitlist control	LSAS (1)	37,3	21-53
Høifødt et al. (2013)	Norway	Replacement	Depression	Yes	Aimed for 7 weeks of weekly brief F2F sessions with therapist, timing flexible, plus 5 modules of online CBT program MoodGym with tailored emails from therapist.	Waitlist control	BDI-II (1)	38,3	18-65
Jacmon et al. (2010)	Australia	Replacement	Depression	Yes	4-6 weeks of treatment. 14 online CBT modules, completed at own pace. Therapist contact via email. Number of F2F sessions set by patient (sample average: 3.7 sessions). A possibility to extend treatment by 6-9 weeks of individual sessions if necessary.	N.A.	BDI (1)	34.97	26-47

Table S3 Continued

Single-armed: bCBT only									
Authors	**Country**	**Blended method**	**Disorder**	**Online therapist contact**	**Blended method**	**Control**	**Outcome instrument**	**Average age**	**Age range**
Kenter et al. (2015)	The Netherlands	Supplemental	Anxiety	Yes	Internet-delivered treatment sessions offered prior, simultaneously, or after FTF treatment. 45 min/exercise, with personalized written feedback from therapist. Encouraged to complete 1-2 exercises/week.	TAU (not randomized)	GAF (2)	35,4	18-91
			Depression				GAF (2)	40,8	
Kooistra et al. (2016)	The Netherlands	Replacement	Depression	Yes	10 F2F sessions and 10 scheduled, asynchronously guided sessions on online platform Minddistrict. Therapist feedback after each session, along with email reminders.	Waitlist control	IDS-SR (1)	37,98	27-50
Meyer et al. (2009)	Germany	Supplemental	Depression	No	9 weeks F2F sessions paired with access to 10 modules of Deprexis.	Waitlist control	BDI (1)	34,76	18-72
Mol et al. (2018)	The Netherlands	Replacement	Depression	Yes	5 biweekly F2F sessions and 10 online sessions with therapist feedback after each session. Message function for practical issues available.	N.A.	QIDS (1)	35,9	21-64

Table S3 Continued

Single-armed: bCBT only									
Authors	**Country**	**Blended method**	**Disorder**	**Online therapist contact**	**Blended method**	**Control**	**Outcome instrument**	**Average age**	**Age range**
Månsson et al. (2013)	Sweden	Supplemental	Anxiety	Yes	8 weeks of individual CBT sessions, paired with access to a mobile-based CBT platform, with option to write messages to therapist.	N.A.	BAI (1)	43	22-70
			Depression				MADRS-S (1)		
Nakao et al. (2018)	Japan	Supplemental	Depression	No	12 weeks of 45 min F2F sessions with access to online treatment modules 30 min each; worked at their own pace and reviewed work with therapist in F2F session.	Waitlist control	GRID-HAMD (1)	40,2	20-65
Schuster et al. (2017)	Austria	Supplemental	Depression	No	8 group sessions (90 min/ each), 8 video-supported online homework modules (offered via an e-learning platform), a 180-slide handout, a semi-structured diary and daily brief relaxation in the first 2 weeks	Waitlist control	CES-D (1)	45,9	Not stated
Schuster et al. (2018)	Austria	Replacement	Depression	Yes	7 weeks of intensive CBT group sessions, along with 90 min personal sessions, alternated with 50-70 min online therapy work, with therapist feedback.	N.A.	CES-D (1)	33,9	23-51

Table S3 Continued

Single-armed: bCBT only									
Authors	**Country**	**Blended method**	**Disorder**	**Online therapist contact**	**Blended method**	**Control**	**Outcome instrument**	**Average age**	**Age range**
Vernmark et al. (2018)	Sweden	Replacement	Depression	Yes	A total of 10 weeks of CBT sessions, 4 F2F sessions, the remaining session held on online platform *Iterapi*, accessed via a computer, tablet or smartphone. Asynchronous communication with therapist, and personalized feedback.	TAU (data not reported)	PHQ-9 (1)	34,7	Not stated
Wahlund et al. (2020)	Sweden	Replacement	Depression	Yes	For adolescents: 12 weekly 45 min F2F sessions. For parents: 5 biweekly CBT-based parent support modules delivered via an online platform, parents could communicate with the therapist via the platform. Adolescents and parents had the same therapist.	N.A.	MINI-KID (3)	14,9	13-17

Note. Disorder = disorder used as main outcome measure, TAU = treatment as usual, CBT = cognitive behavioral therapy, F2F = face-to-face, IPT = interpersonal psychotherapy, PST = problem-solving therapy. Outcome instruments: BAI = Beck Anxiety Inventory; BDI (II): Beck Depression Inventory (II); CES-D = The Center for Epidemiological Studies Depression Scale; DASS-21 = Depression Anxiety Stress Scale; EQ-5D-5L = global health instrument by EuroQol Group; IDS-SR = Inventory of Depressive Symptomatology Self-Report; MADRS-S = Montgomery Åsberg Depression Rating Scale (self-report version); MASC-C = Multidimensional Anxiety Scale for Children; MINI-KID = Mini International Neuropsychiatric Interview for Children and Adolescents; PHQ-9 = Patient Health Questionnaire - Depression; QIDS = Quick Inventory of Depressive Symptomatology; QIDS-A = Quick Inventory of Depressive Symptomatology – Adolescents. SMFQ-C = The Short Mood and Feelings Questionnaire. Outcome instrument code: 1 = Symptom-specific self-report, 2 = Global health measure, 3 = Clinician-rated severity.