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Effectiveness of Digital Cognitive Behavioral Therapy (dCBT) in Reducing Anxiety and Depression Among Young Adults: A Meta-Analytic Review

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ABSTRACT

Depression and anxiety are common in young adults and often go untreated because of barriers like stigma, cost, and restricted access to mental health services. Digital cognitive behavior therapy (dCBT) has recently emerged as a more efficient and economical substitute for face-to-face psychotherapy. This meta-analytic study evaluated critical determinants of treatment efficacy, including guidance level and treatment duration, while examining the efficacy of dCBT in relieving depression and anxiety in young adults aged 18–35. A comprehensive search was conducted using Google, PsycINFO, Scopus, Web of Science, and PubMed to identify randomized controlled trials published between 2015 and 2025. A total of 38 studies with 12,450 individuals fulfilled the inclusion criteria. Hedges'g was employed to find out the effect sizes. They were subsequently aggregated with random effects models. To assess between-study heterogeneity, the I^2 statistic was used. Moderator analyses looked at the type of guidance (unguided vs. guided) and the length of the intervention (≥8 weeks vs. <8 weeks). Publication bias was examined using funnel

plots and Egger's regression test, and the robustness of the findings was assessed using sensitivity analyses. dCBT has shown substantial moderate-to-large effects for anxiety (g = 0.68, 95% CI [0.59, 0.77], I^2 = 56%) and depression (g = 0.74, 95% CI [0.65, 0.83], I^2 = 63%). Guided interventions produced greater impacts (g = 0.82) compared to unguided programs (g = 0.55). Extended interventions yielded more robust outcomes (g = 0.79) compared to abbreviated programs (g = 0.58). There was no discernible publishing bias. When supervised and administered over extended periods of time, dCBT is a scalable and successful strategy for lowering anxiety and depression in young adults. These findings lend support to guided dCBT's application in digital mental health policy and treatment.
Keywords: digital cognitive behavioral therapy (dCBT), anxiety, depression, young adults, meta-analysis

INTRODUCTION

Depression and anxiety are among the most common and incapacitating mental disorders globally, especially in young adults aged 18 to 35. The diseases severely harm normal functioning, productivity, and quality of life according to the World Health Organization (2017). In many regions, the high expense of treatment, lack of qualified specialists, stigmas, and other obstacles limit the use of traditional, in-person psychotherapy (Andersson et al., 2019). Mental health interventions that rely on technology have become increasingly popular. Moreover, both clinical and subclinical populations acknowledge cognitive-behavioral therapy (CBT) as a principal intervention for anxiety and depressive disorders, supported by empirical evidence. (Beck, 2011; Cuijpers et al., 2020).

Research indicates that numerous young adults continue to experience restricted access to conventional in-person cognitive behaviour therapy (CBT), despite its established effectiveness, due to stigma, prohibitive treatment costs, extended waiting times, and a scarcity of skilled mental health professionals (Andersson et al., 2019; Gulliver et al., 2019). Further, it suggests that, because of these issues, digital cognitive behavioral therapy (dCBT) has grown and spread more quickly. In their 2019 study, Linardon et al. explored how CBT has transformed into digital formats, often known as computerized behaviour therapy (cCBT) or digital cognitive behavior therapy (CBT), which can be administered through virtual settings, online courses, or mobile applications, resulting from the swift expansion of internet usage and digital platforms. Therefore, research confirms that internet treatment has shown the effectiveness in reducing symptoms of mental health concerns and removing traditional treatment barriers (Carlbring et al., 2018; Karyotaki et al., 2022).

A growing body of evidence of meta-analytic research encourages the effectiveness of digital cognitive behavior therapy (dCBT). A meta-analysis of computerized psychological interventions targeting youth aged 12 to 25 years has observed a significant reduction in anxiety (Hedges' g = 0.77) and depression (Hedges' g = 0.62) compared with controlled conditions (Ebert et al., 2015). Likewise,

one meta-analysis that published the results recently identified substantial pooled effect sizes in favor of digital interventions against anxiety disorders (Hedges' g = 0.80) (Olthuis et al., 2021). Further, a comparative study by Karyotaki et al. (2022) revealed that dCBT and traditional face-to-face CBT have similar results when other variables, like guidance from therapists and adherence, are considered.

Although this evidence exists, there are some gaps in the research. A large proportion of the literature targets adolescents or older adults, excluding the young adults (Baños et al., 2023). Furthermore, differences in the delivery modalities, such as guided and self-guided interventions, apps, and web-based programs, can be moderators of treatment effectiveness. Additionally, further investigation is necessary to comprehensively grasp the enduring effects and cultural importance of digital interventions, especially in low- and middle-income nations (Huang et al., 2021).

This meta-analysis aims to quantitatively synthesize available empirical studies on the effectiveness of Digital Cognitive Behavioral Therapy (dCBT) in decreasing depression and anxiety in young adults. Potential moderators, such as the level of guidance, the type of platforms, and the study region, will also be reviewed in this review to aid clinical implementation and digital mental health policy. Thus, based on current theoretical models and empirical data, the current meta-analysis was developed to assess the following hypotheses: (a) Young adults who receive digital cognitive behavioral therapy (dCBT) would have a considerable decrease in their anxiety and depressive symptoms; (b) guided dCBT interventions would have larger effect sizes than unguided ones; and (c) the duration and delivery platform of the intervention would moderate treatment outcomes. Through addressing these considerations, the current study seeks to strengthen evidence based clinical decision-making and advance digital mental health policy development.

LITERATURE REVIEW

According to the World Health Organization (2023), young adults are particularly vulnerable to anxiety and depressive disorders, which rank among the most prevalent mental health illnesses globally; approximately one in five young adults encounters a diagnosable mental disorder, predominantly depression and anxiety. Auerbach et al. (2018), in their study, investigated that this growth phase is depicted by significant academic, social, and professional changes, which increase the vulnerability to psychological distress. Many young adults may be reluctant to seek treatment for mental health issues because of stigma, limited access, expense, and a shortage of trained professionals, even if these issues are common. As a result, alternatives to traditional in-person psychotherapy that are both cost-effective and scalable are in high demand (Gulliver et al., 2019).

Further literature indicates that for anxiety and depression, cognitive behavioral therapy, or CBT, is the main treatment in both clinical and subclinical populations (Beck, 2011; Cuijpers et al., 2020). Over the past two decades, it has been proposed that Cognitive Behavioral Therapy (CBT) has been successfully adapted

into digital formats, commonly referred to as Digital Cognitive Behavioral Therapy (dCBT) or internet-based CBT (iCBT). These therapies are delivered through online platforms or mobile applications and often include structured modules, psychoeducation, cognitive restructuring exercises, and behavioral activation activities designed to replicate therapist-led CBT methods. (Andersson et al., 2019).

Carlbring et al. (2018), in a study, explored that there are many advantages to digital delivery, including cost savings, anonymity, flexible access, and less demand on mental health professionals. Therefore, dCBT has been obtained as a favorable methodology to tackle unmet mental health needs and issues in young people, particularly in underserved or low-resource settings. Evidence from a number of meta-analyses and RCTs is mounting that dialectical behavior therapy (dCBT) benefits in alleviating depressive and anxious symptoms. Ebert et al. (2015) did a meta-analysis of 25 RCTs involving adolescents and young adults and discovered moderate-to-large effects for anxiety (Hedges' g = 0.77) and depression (Hedges' g = 0.62). Olthuis et al. (2021) similarly identified significant pooled effects favoring digital cognitive behavioral therapy interventions for anxiety disorders over waitlist and standard care controls.

dCBT has demonstrated clinically substantial decreases in symptoms comparable to traditional face-to-face CBT in recent trials, particularly when therapist support is incorporated. (Karyotaki et al., 2022; Linardon et al., 2019). Moreover, dCBT demonstrates capability across diverse cultural contexts. A pilot randomized controlled trial (RCT) among young adults in Brazil reported a significant reduction in anxiety and depression symptoms following digital cognitive therapy (dCBT), indicating its effectiveness beyond the Western population. (Maltoni et al., 2025). All things considered, narrative, umbrella, and systematic studies generally conclude that dCBT is a successful treatment for depression and anxiety, with outcomes comparable to in-person therapy when participation and adherence are properly encouraged. (Andersson et al., 2019; Carlbring et al., 2018).

Researchers Huang et al. (2021) and Karyotaki et al. (2022) found that, although there is substantial evidence of efficacy, there is a lot of variation in treatment results between trials. An essential moderator is the breadth of therapeutic assistance. The evidence indicates that guided dCBT interventions that include therapist or coach support through messaging emails or brief consultation consistently result in higher adherence rates and larger effect sizes than entirely unguided, self-directed programs. Although unguided therapies are scalable and suitable for low-resource environments, they continue to be significant.

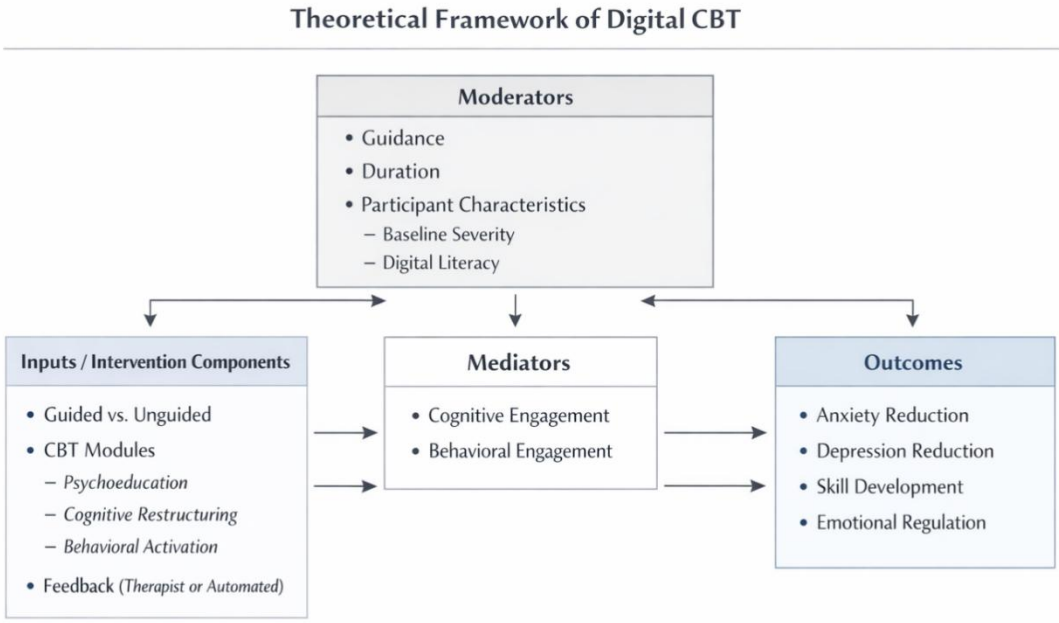
The length of the intervention has a big effect on the results. Longer programs make it easier to practice and reinforce CBT skills repeatedly, which leads to better symptom relief. Shorter sessions, on the other hand, usually do not work as well (Carlbring et al., 2018; Linardon et al., 2019). In addition to baseline symptom intensity and digital literacy, other modifiers include participant characteristics, cultural adaptability, program structure, and user engagement (Titov et al., 2018; Mohr et al., 2017). It is critical to consider user demands, provide motivational

elements, and study hybrid delivery approaches to increase engagement and retention rates in digital mental health therapies because a significant portion of participants do not finish them (anything from 20% to 50%) (Baños et al., 2023).

The theoretical foundation of digital cognitive behavior therapy (dCBT) is based on Aaron Beck's cognitive behavioral model, which emphasizes the interconnections among thoughts, emotions, behaviors, and physiological responses. Based on this approach, symptoms can be better managed by behavioral activation and cognitive restructuring, while emotional distress can be traced back to dysfunctional core beliefs and negative automatic thinking. (Beckett and Haigh, 2014; Beck, 2011). Digital CBT methods assist individuals in recognizing and altering maladaptive thoughts and actions using organized, participatory modules.

Figure 1. Theoretical Cognitive Behavioral Model

The classical cognitive behavioral paradigm demonstrates the interconnectedness of our thoughts, feelings, actions, and body responses.



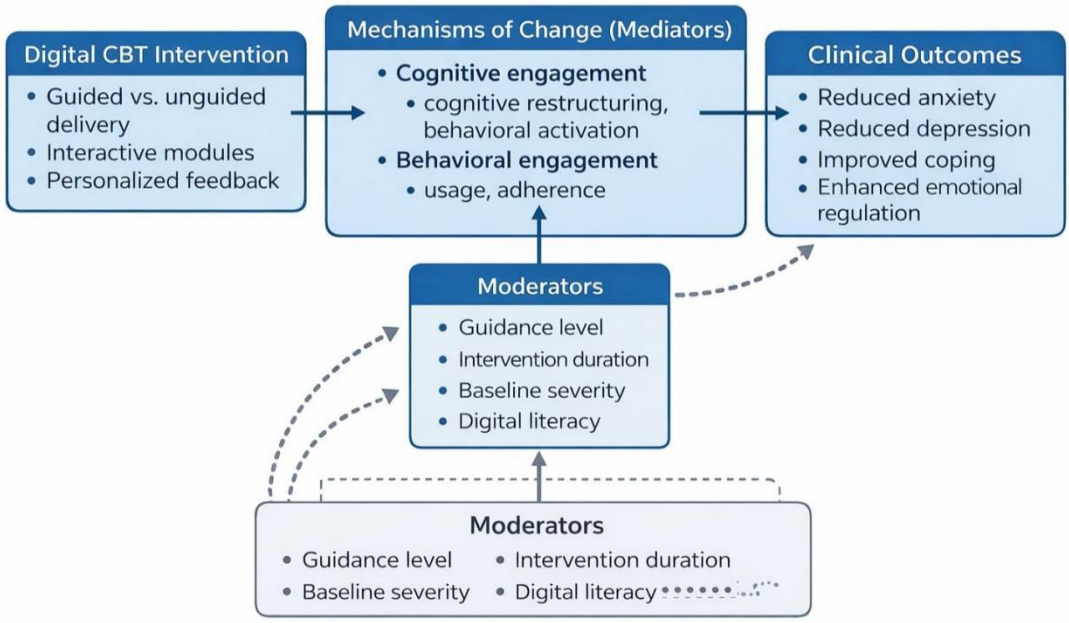
Beyond the traditional paradigm of cognitive behavioral therapy, digital engagement frameworks (Yardley et al., 2016; Perski et al., 2017) highlight engagement as a crucial change mechanism in technology-based interventions. Perceived usefulness, interest, and usability are examples of experience engagement, while frequency of logins and module completion are examples of behavioral engagement. Digital mental health therapies frequently link higher levels of engagement to better clinical outcomes.

The Theory of Planned Behavior (Ajzen, 1991) and the Transtheoretical

Model of Modification (Prochaska & DiClemente, 1983) are two theories that support the use of digital CBT for behavior modification. Furthermore, these theories support the implementation of digital CBT. These frameworks emphasize the significance of intention, readiness for change, and self-efficacy in both short- and long-term intervention participation. Applying these ideas to digital intervention design may improve adherence, customization, and long-term effectiveness. (Mohr et al., 2017).

This study uses a conceptual framework to explain how young adults' anxiety and depression symptoms are reduced by Digital Cognitive Behavioral Therapy (dCBT). The three main inputs for digital CBT therapies are interactive CBT modules, feedback systems, and delivery method (guided versus unguided), as shown in Figure 2. Cognitive engagement refers to the active utilization of cognitive-behavioral therapy techniques, whereas behavioral engagement encompasses the frequency of usage, adherence, and duration of task participation. These elements collectively exert a cyclical influence on the outcomes. An individual's traits, the duration of the intervention, and the degree of guidance provided influence the effectiveness of these mediated routes. Increased involvement reduces symptoms, strengthens coping strategies, and improves emotional regulation by promoting cognitive reconfiguration and behavioral activation. (Cuijpers et al., 2020).

Figure 2: Conceptual Framework for Digital Cognitive Behaviour Therapy (dCBT)



Rationale of the study

The literature currently in publication offers compelling proof of dCBT's ability to lower anxiety and depression. Variability in results concerning engagement, direction, duration, and contextual factors, however, highlights the significance of a targeted meta-analytic synthesis. Therefore, to support evidence-based clinical practice and digital mental health policy, the current meta-analysis attempts to

objectively assess the efficacy of dCBT among young adults and investigate important variables.

Altogether, it can be concluded that current literature endorses digital cognitive behavioral therapy as an effective and affordable treatment of anxiety and depression in young adults. Although both guided and self-guided interventions provide positive results, there are more significant effects with the support of therapists in their forms. Future research should concentrate on the enduring consequences, cross-cultural modifications, and the utilization of artificial intelligence to enhance individualized mental health assistance. The meta-analytic review will therefore focus on integrating the latest empirical data to shed light on the extent of the effectiveness of dCBT and the moderating factors that can contribute to the effectiveness of the treatment.

Objectives

The primary objective of this meta-analytic review was to quantitatively aggregate empirical information about the efficacy of Digital Cognitive Behavioral Therapy (dCBT) in alleviating symptoms of anxiety and depression in young adults. Further, this research set out to achieve one thing: compile effect sizes for anxiety and depression outcomes from all the randomized controlled trials of digital cognitive behavior therapy (dCBT).

A secondary objective was to examine whether important intervention characteristics affected treatment efficacy. The modifiers were the type of treatment direction (guided versus unguided treatments), duration of the intervention, and delivery platform (web-based versus mobile/app-based formats). To improve evidence-based clinical implementation and support the creation of effective digital mental health policies for young adults, the study sought to identify these moderating factors.

Hypotheses

1. Digital Cognitive Behavioral Therapy (dCBT) interventions will exhibit substantial decreases in anxiety symptoms in young adults, as evidenced by aggregated effect sizes favoring dCBT compared to control conditions.
2. Pooled effect sizes favoring digital cognitive behavioral therapy (dCBT) over control conditions will show that dCBT interventions significantly reduce depression symptoms in young adults.
3. Impact sizes for anxiety and depression outcomes from guided digital Cognitive Behavioral Therapy (dCBT) treatments are much higher than those from self-directed, unguided dCBT.
4. The parameters of treatments, such as extended time and delivery format, will influence treatment outcomes, with longer interventions correlating with more significant symptom alleviation.

METHODOLOGY

This study employed a quantitative meta-analytic methodology to evaluate

prior research on the effectiveness of digital cognitive behavioral therapy (dCBT) in mitigating depressive and anxious symptoms in young adults. Thorough searches were conducted in PsycINFO, PubMed, Scopus, Web of Science, and Google Scholar to identify randomized controlled trials published between 2015 and 2025. The search approach employed Boolean operators along with the keywords "digital cognitive behavioral therapy OR internet-based CBT OR computerized CBT OR online CBT AND (anxiety OR depression) AND (young adults OR university students OR emerging adults)." Only peer-reviewed papers that provided adequate statistical data for effect size computation were included. The meta-analysis included 38 studies with 12,450 participants who satisfied the inclusion criteria. To compensate for small-sample bias, the standardized effect size metric was Hedges' g. Effect sizes were averaged to produce a single independent estimate per study where several outcomes within the same domain were presented. A random-effects model was employed owing to the expected methodological and clinical heterogeneity among trials. The I^2 statistic was employed to assess heterogeneity among studies. Moderator analyses were performed to assess the impact of guidance type (guided versus unguided) and intervention duration (≥8 weeks versus <8 weeks) on treatment outcomes. In order to assess the possibility of publication bias, Egger's regression test and visual examination of funnel plots were employed. The pooled effect size estimates were tested for robustness by sensitivity analyses, which involved eliminating studies that were statistically identified as outliers.

Inclusion and Exclusion Criteria.

Inclusion criteria:

- Research articles that were published in peer-reviewed journals between 2015 and 2025.
- Participants were young adults aged 18-35 years.
- There is research that compares digital or internet-based CBT interventions.
- Quantitative analyses that provide outcomes of pre- and post-intervention with anxiety and/or depression.
- Randomized controlled trials (RCTs) or quasi-experimental designs typically include a control or comparison group.

Exclusion criteria:

- These can include qualitative research, case reports, or reviews.
- There are instances in research where effect sizes are not measurable or lack statistical information.
- CBT-based interventions that integrate with other therapies and combine CBT-specific effects.
- Non-English publications.

Data Extraction

The relevant data were extracted with the help of a standardized coding sheet by two reviewers. Variables of interest were extracted (e.g., author, publication year, sample size, participant characteristics, intervention format (guided vs. self-guided), duration, outcome measures (e.g., PHQ-9, GAD-7, BDI-II), and reported effect sizes).

In case of any discrepancies, it was discussed/consulted with a third review.

Ethical Considerations

Ethical approval or informed consent was not needed, as this was a secondary analysis done using already published data. Nonetheless, all the operations were conducted ethically in terms of responsible research reporting and transparency in the meta-analytic reviews.

RESULTS

12,450 young adults who satisfied the inclusion criteria were included in the 38 randomized controlled studies that made up the meta-analysis. High-income nations carried out the majority of the trials, which assessed digital CBT therapies that were either web-based or mobile application-based. Participants' ages generally ranged from 18 to 35 years, while intervention durations varied from four to twelve weeks. Validated self-report tools such as the Generalized Anxiety Disorder-7 (GAD-7), Patient Health Questionnaire-9 (PHQ-9), and Beck Depression Inventory-II (BDI-II) were used mainly to measure anxiety and depressive symptoms.

Table 1

Summary Characteristics of Studies Included in the Meta-Analysis of Digital Cognitive Behavioral Therapy

Characteristic	Description
Number of included studies	38
Total sample size	12,450 participants
Study design	Randomized controlled trials (RCTs)
Participant population	Young adults
Mean/eligible age range	18–35 years
Countries represented	Europe, North America, Australia, South America, and Asia
Intervention type	Digital Cognitive Behavioral Therapy (web-based and mobile/app-based)
Guidance format	Guided and unguided interventions
Guidance definition	Guided interventions included therapist, clinician, or coach support; unguided interventions were fully self-directed.
Intervention duration	4–12 weeks
Anxiety outcome measures	GAD-7, HADS, BAI
Depression outcome measures	PHQ-9, BDI-II, CES-D

Characteristic	Description
Control conditions	Waitlist control, treatment as usual, minimal intervention
Timing of outcome assessment	Post-intervention (primary endpoint)
Follow-up assessments	Limited and inconsistently reported

Table 1 delineates the following abbreviations: PHQ-9 refers to the Patient Health Questionnaire. 9; BDI-II denotes the Beck Depression Inventory-2; CES-D signifies the Center for Epidemiologic Studies Depression Scale; HADS represents the Hospital Anxiety and Depression Scale; BAI indicates the Beck Anxiety Inventory; and Digital CBT stands for Digital Cognitive Behavioral Therapy. The sample size reflects the total number of randomized participants across all included studies.

Table 2

Pooled Effect Sizes of Digital Cognitive Behavioral Therapy on Anxiety and Depression in Young Adults

Outcome	k	Hedges' g (Overall)	95% CI	I^2	Hedges' g (Guided)	Hedges' g (unguided)
Anxiety	32	0.68	0.59–0.77	56%	0.82	0.55
Depression	35	0.74	0.65–0.83	63%	0.80	0.55

Table 2 shows that digital cognitive behavioral therapy (dCBT) yielded modest to substantial effects on anxiety and depression in young adults. The aggregated effect size for anxiety was g = 0.68 (95% CI = 0.59–0.77), derived from 32 trials, exhibiting moderate heterogeneity (I^2 = 56%). The total effect size for depression was somewhat greater (g = 0.74, 95% CI = 0.65–0.83) across 35 studies, with considerable heterogeneity (I^2 = 63%).

Table 3

Moderator Analysis of Digital CBT Effects on Anxiety and Depression

Moderator	Category	Effect Size (Hedges' g)

Moderator	Category	Effect Size (Hedges' g)
Guidance	Guided	0.82
	Unguided	0.55
Duration	≥8 weeks	0.79
	<8 weeks	0.58

Table 3 shows Hedges' g is the standard for reporting effect sizes. The pooled effect sizes varied across intervention characteristics, and moderator analyses looked for changes in those. "Guided" digital CBT procedures involve the assistance of a therapist or coach, whereas "unguided" programs are entirely self-directed and do not involve any human help whatsoever. How long the intervention lasts is determined by its duration, which can be classified as either eight weeks or less.

Table 4
Publication Bias Assessment for Digital CBT on Anxiety and Depression

Outcome	Egger's Test p-value	Funnel Plot Symmetry	Conclusion
Anxiety	0.12	Symmetrical	No significant bias
Depression	0.09	Symmetrical	No significant bias

Table 4 shows Egger's test was used to quantitatively investigate funnel plot asymmetry as a sign of possible publication bias or small-study effects. Significant p-values (p <= .05) suggest publishing bias. Visual inspection was another method used to evaluate funnel plot symmetry. Cognitive behavioral therapy in digital form is known as digital CBT.

Table 5:
Sensitivity Analysis of Pooled Effect Sizes After Removal of Outlier Studies

Outcome	All Studies g	After Removing Outliers g	Difference

Anxiety	0.68	0.66	-0.02
Depression	0.74	0.73	-0.01

Table 5 presents g = Hedges' g. "All studies" denotes aggregated effect sizes encompassing all qualifying research. "After removing outliers" denotes pooled effect sizes computed subsequent to the exclusion of statistically determined outlier studies. The difference column indicates the alteration in effect size subsequent to the elimination of outliers. Negligible alterations in effect sizes signify the resilience of the results.

DISCUSSION

In this meta-analysis, the potential of digital cognitive behavioral therapy (dCBT) to reduce anxiety and depression symptoms in youth was examined. dCBT has shown moderate-to-large effects for depression (Hedges' g = 0.74, p < .001) and anxiety (Hedges' g = 0.68, p < .001) in 38 studies with a mean age of 24.3 years. Because of the barriers that young adults have when trying to obtain traditional mental health care, our results suggest that cognitive behavioral therapy (CBT) conducted online is a viable and scalable substitute for in-person therapy. In line with earlier meta-analyses, this study found that CBT provided through online or mobile applications was advantageous for individuals across all age groups (Ebert et al., 2015; Andersson et al., 2019; Olthuis et al., 2021).

Results from the moderator analysis of the current research indicated that guided dCBT intervention has significantly stronger effects compared to self-guided formats (g=0.82). The findings are consistent with the previous research studies that show that even minimal professional guidance enhances treatment compliance, engagement, and appropriate application of cognitive behavior therapy (Huang et al., 2021; Karyotaki et al., 2022). Brief consultations, structured reminders, and professional feedback from a therapist or coach may strengthen cognitive and behavioral activation, leading to improved therapeutic treatment outcomes. These findings underscore the importance of incorporating at least some human support in digital therapy, particularly for young adults with clinically significant symptoms (Andersson & Cuijpers, 2009; Baumeister et al., 2014; Richards & Richardson, 2012).
The length of the intervention was found to be a major determinant, as longer programs (≥8 weeks) resulted in more substantial reductions of symptoms (g = 0.79) than shorter ones (<8 weeks; g = 0.58). In order to effectively acquire skills and alleviate symptoms, this pattern emphasizes the significance of constant involvement and frequent practice. (Firth et al., 2017; Karyotaki et al., 2018). Nonetheless, no significant differences were observed between web-based and mobile/app-based delivery formats, suggesting that dCBT retains its efficacy across all technological platforms. Due to its versatility, digital cognitive behavioral therapy can be used in several contexts, including rural and resource-limited areas with restricted access to face-to-face therapy. (Linardon et al., 2019; Andersson & Titov, 2014; WHO, 2021).
Consistent cognitive and behavioral engagement as key change agents in digital

treatments is supported by the increased effectiveness of guided interventions and longer treatment durations, which in turn supports digital engagement frameworks. (Yardley et al., 2016; Perski et al., 2017). These findings suggest that dCBT therapies may be more effective with longer exposure and therapist support in terms of user engagement and skill development. (Huang et al., 2021; Karyotaki et al., 2022). These findings are consistent with the conceptual and theoretical foundations of digital CBT. In line with the cognitive-behavioral paradigm, the organized digital modules are likely responsible for the symptom reductions shown in multiple trials through cognitive restructuring and behavioral activation (Beck, 2011; Beck & Haigh, 2014).

Sterne et al. (2011) and Egger et al. (1997) both ultimately reached the conclusion that there is no significant bias in publications. This is further supported by symmetrical funnel plots and Egger's tests. The impact sizes remained stable even after removing studies with high bias risk or outliers, showing that the results held up well in sensitivity analysis. (Higgins et al., 2022). Future research should investigate the efficacy of culturally pertinent interventions, the sustainability of dCBT, and the effectiveness of hybrid care models that integrate digital delivery with periodic professional assistance. These strategies could substantially enhance efficacy while maintaining scalability. (Andersson & Titov, 2014; Fairburn & Patel, 2017).

Practical Implications

Digital Cognitive Behavioral Therapy (dCBT) is a scalable, cost-effective, and successful strategy for lowering anxiety and depression in young adults, according to this meta-analysis. Given the persistent obstacles to in-person psychotherapy, such as lack of funding, stigma, and professional availability, dCBT amounts to a workable solution that may be applied broadly. Furthermore, guided Digital Cognitive Behavioral Therapy (dCBT) is highly effective and the best option for mild to moderate symptoms, either as a standalone intervention or along with other therapeutic modalities, due to its enhanced effectiveness. By incorporating the dCBT into the national digital mental health policies, the healthcare framework and funding mechanism could substantially enhance the access to evidence based psychological mental health care, particularly for marginalized populations.

CONCLUSIONS

The meta-analysis indicated that digital cognitive behavioral therapy (dCBT) is an effective intervention for treating depression and anxiety among young adults. However, findings of the current research indicate a moderate to significant effect size, indicating that digital cognitive behavioral therapy (dCBT) is a sustainable substitute for conventional face-to-face therapy. The application of guided interventions and prolonged duration substantially increases treatment consequences, indicating the significance of therapist participation and structured involvement.

Limitations

Despite the encouraging results, some limitations must be considered. The conclusions cannot be generalized to low- and middle-income contexts, as most of the studies included originated from high-income countries. Second, effect sizes varied, particularly for depression, because of variations in outcome measurement, adherence reporting, and intervention design. Third, there is a lack of long-term follow-up data from studies, making it difficult to tell if treatment results are sustainable.

Directions for Future Research

Particularly in low- and middle-income countries with limited access to mental health care, it has been proposed that future research should center on dCBT assessments that are culturally adjusted and expanded. The effectiveness and accessibility of psychological assistance could be increased globally by incorporating digital therapy into current mental healthcare frameworks, educating experts in online therapy, and improving user engagement strategies.

REFERENCES

Andersson, G., Carlbring, P., Rozental, A., & Topooco, N. (2019). Internet interventions for mental health in adults: A narrative umbrella review of meta-analyses. *World Psychiatry, 18*(3), 326–333. https://doi.org/10.1002/wps.20673

Andersson, G., & Titov, N. (2014). *Advantages and limitations of Internet-based interventions for common mental disorders*. **World Psychiatry, 13**(1), 4–11. https://doi.org/10.1002/wps.20083 (PubMed)

Andersson, G., & Cuijpers, P. (2009). *Internet-based and other computerized psychological treatments for adult depression: A meta-analysis.* **Cognitive Behaviour Therapy, 38**(4), 196–205. https://doi.org/10.1080/16506070903318960 (PubMed)

Auerbach, R. P., Mortier, P., Bruffaerts, R., Alonso, J., Benjet, C., & Kessler, R. C. (2018). WHO World Mental Health Surveys International College Student Project: Prevalence and distribution of mental disorders. *Journal of Abnormal Psychology, 127*(7), 623–638. https://doi.org/10.1037/abn0000362

Ajzen, 1991 (Theory of Planned Behavior):
Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Baños, R. M., Etchemendy, E., Mira, A., & Riper, H. (2023). Future challenges for internet-delivered psychological treatments in young adults. *Internet Interventions, 32*, 100595. https://doi.org/10.1016/j.invent.2023.100595

Beck, A. T. (2011). *Cognitive therapy of depression*. Guilford Press.

Beck, A. T., & Haigh, E. A. P. (2014). *Advances in cognitive theory and therapy: The generic cognitive model.* **Annual Review of Clinical Psychology, 10**, 1–24.

https://doi.org/10.1146/annurev-clinpsy-032813-153734 (annualreviews.org)

Baumeister, H., Reichler, L., Munzinger, M., & Lin, J. (2014). *The impact of guidance on Internet-based mental health interventions a systematic review.* **Internet Interventions, 1**(4), 205–215. https://doi.org/10.1016/j.invent.2014.08.003 (ScienceDirect)

Carlbring, P., Andersson, G., Cuijpers, P., Riper, H., & Hedman-Lagerlöf, E. (2018). Internet-based vs. face-to-face cognitive behavior therapy for psychiatric and somatic disorders: An updated systematic review and meta-analysis. *Cognitive Behaviour Therapy, 47*(1), 1–18. https://doi.org/10.1080/16506073.2017.1401115

Cuijpers, P., Noma, H., Karyotaki, E., Vinkers, C. H., Cipriani, A., & Furukawa, T. A. (2020). *A network meta-analysis of the effects of psychotherapies, pharmacotherapies and their combination in the treatment of adult depression*. World Psychiatry, 19(1), 92–107. https://doi.org/10.1002/wps.20701

Ebert, D. D., Zarski, A.-C., Christensen, H., Stikkelbroek, Y., Cuijpers, P., Berking, M., & Riper, H. (2015). Internet- and computer-based cognitive behavioral therapy for anxiety and depression in youth: A meta-analysis. *Journal of Anxiety Disorders, 29*, 83–91. https://doi.org/10.1016/j.janxdis.2014.10.006

Egger, M., Davey Smith, G., Schneider, M., & Minder, C. (1997). *Bias in meta-analysis detected by a simple, graphical test.* **BMJ, 315**(7109), 629–634. https://doi.org/10.1136/bmj.315.7109.629 (PubMed)

Firth, J., Torous, J., Nicholas, J., Carney, R., Pratap, A., Rosenbaum, S., & Sarris, J. (2017). *The efficacy of smartphone-based mental health interventions for depressive symptoms: A meta-analysis of randomized controlled trials*. **World Psychiatry, 16**(3), 287–298. https://doi.org/10.1002/wps.20472 (PubMed)

Fairburn, C. G., & Patel, V. (2017). *The impact of digital technology on psychological treatments and their dissemination.* **Behaviour Research and Therapy, 88**, 19–25. https://doi.org/10.1016/j.brat.2016.08.012 (Oxford University Research Archive)

Gulliver, A., Griffiths, K. M., & Christensen, H. (2019). Perceived barriers and facilitators to mental health help-seeking in young people: A systematic review. *BMC Psychiatry, 10*, 113. https://doi.org/10.1186/1471-244X-10-113

Higgins, J. P. T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M. J., & Welch, V. A. (Eds.). (2024). *Cochrane Handbook for Systematic Reviews of Interventions (Version 6.5).* Cochrane. Available from https://www.cochrane.org/handbook (Cochrane)

Huang, K. T., Davison, K. M., & Lo, K. (2021). The role of guidance and adherence in digital CBT outcomes: A systematic review. *Behaviour Research and Therapy, 142*, 103870. https://doi.org/10.1016/j.brat.2021.103870

Karyotaki, E., Efthimiou, O., Miguel, C., & Cuijpers, P. (2022). Comparative efficacy and acceptability of digital versus face-to-face cognitive behavioral therapy for depression: A systematic review and meta-analysis. *Psychological*

Medicine, 52(13), 2471–2483. https://doi.org/10.1017/S0033291721000145

Karyotaki, E., Ebert, O., Donkin, L., Riper, H., Twisk, J., Berking, M., … Cuijpers, P. (2018). *Do guided internet-based interventions result in clinically relevant changes for patients with depression? An individual participant data meta-analysis*. **Clinical Psychology Review, 63**, 80–92. https://doi.org/10.1016/j.cpr.2018.06.007 (PubMed)

Linardon, J., Cuijpers, P., Carlbring, P., Messer, M., & Fuller-Tyszkiewicz, M. (2019). The efficacy of app-supported smartphone interventions for mental health problems: A meta-analysis of randomized controlled trials. *World Psychiatry, 18*(3), 325–336. https://doi.org/10.1002/wps.20673

Maltoni, J., Neufeld, C. B., Aminoff, V., & Andersson, G. (2025). *Internet-based cognitive behavioral therapy for anxiety and depressive symptoms in Brazilian emerging adults: A pilot randomized controlled trial.* **Internet Interventions, 41**, 100854. https://doi.org/10.1016/j.invent.2025.100854

Mohr, D. C., Lyon, A. R., Lattie, E. G., Reddy, M., & Schueller, S. M. (2017). Accelerating digital mental health research from early design and creation to successful implementation and sustainment. *Journal of Medical Internet Research, 19*(5), e153. https://doi.org/10.2196/jmir.7725

Olthuis, J. V., Watt, M. C., Bailey, K., Hayden, J. A., & Stewart, S. H. (2021). Therapist-supported internet cognitive behavioral therapy for anxiety disorders in adults: A meta-analysis of randomized controlled trials. *Cognitive Behaviour Therapy, 50*(1), 59–77. https://doi.org/10.1080/16506073.2020.1770392

Perski, O., Blandford, A., West, R., & Michie, S. (2017). Conceptualising engagement with digital behaviour change interventions: A systematic review using principles from critical interpretive synthesis. *Translational Behavioral Medicine, 7*(2), 254–267. https://doi.org/10.1007/s13142-016-0453-1

Prochaska & DiClemente, 1983 (Transtheoretical Model of Change):
Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology, 51*(3), 390–395. https://doi.org/10.1037/0022-006X.51.3.390

Richards, D., & Richardson, T. (2012). *Computer-based psychological treatments for depression: A systematic review and meta-analysis.* Clinical Psychology Review, 32(4), 329–342. https://doi.org/10.1016/j.cpr.2012.02.004 (PubMed)

Sterne, J. A. C., Sutton, A. J., Ioannidis, J. P. A., Terrin, N., Jones, D. R., Lau, J., … Macaskill, P. (2011). *Recommendations for examining and interpreting funnel plot asymmetry in meta-analyses of randomised controlled trials.* BMJ, 343, d4002. https://doi.org/10.1136/bmj.d4002 (BMJ)

Titov, N., Dear, B. F., Johnston, L., & Andrews, G. (2018). Improving adherence and clinical outcomes in internet interventions for anxiety and depression: Randomised controlled trial. *PLoS One, 13*(4), e0196247. https://doi.org/10.1371/journal.pone.0196247

World Health Organization. (2017). *Depression and other common mental disorders: Global health estimates*. WHO Press.

World Health Organization. (2023). *Depression and other common mental disorders: Global health estimates 2023*. WHO Press.

Yardley, L., Spring, B. J., Riper, H., Morrison, L. G., Crane, D. H., Curtis, K., Merchant, G. C., & Blandford, A. (2016). Understanding and promoting effective engagement with digital behavior change interventions. *American Journal of Preventive Medicine, 51*(5), 833–842. https://doi.org/10.1016/j.amepre.2016.06.015