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Effectiveness of CBT in reducing anxiety to adolescents: A systematic literature review

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Abstract

Background: Anxiety disorders in adolescents are a growing global concern, with the World Health Organisation (WHO) reporting a prevalence of over 10% worldwide. In Indonesia, 15.6% of adolescents experience anxiety symptoms, which impact their social, academic, and emotional development. Cognitive Behavioural Therapy (CBT) has been proven effective in reducing anxiety, but evidence regarding its effectiveness in adolescents requires further synthesis.

Purpose: To examine the effectiveness of CBT in reducing anxiety to adolescents.

Methods: A systematic review was conducted of 10 studies (2013–2025) using databases such as ScienceDirect, Scopus, and Google Scholar. Inclusion criteria included randomised controlled trials (RCTs), quasi-experimental studies, and articles focusing on adolescents aged 10–19 years. The JBI was used as a critical appraisal tool to assess risk of bias, and data were synthesised thematically.

Results: CBT significantly reduced anxiety symptoms in adolescents in various studies ($p < 0.05$). School-based CBT and internet-based CBT (iCBT) demonstrate equivalent effectiveness to traditional methods, with results persisting at follow-up (6–12 months). However, brief CBT interventions show limitations in terms of non-inferiority compared to standard protocols. Poorer outcomes are associated with inadequate adaptation of CBT techniques to developmental stages.

Conclusion: CBT is an effective intervention for anxiety in adolescents, especially when integrated into school programmes or digital platforms. Adapting CBT to developmental stages and ensuring long-term monitoring are essential to maximise impact. Recommendations include expanding access to CBT in resource-limited settings and improving health policies to prioritise adolescent mental health.

Keywords: Adolescent Anxiety; Cognitive Behavioural Therapy (CBT); Mental Health Intervention; School-Based Programme.

INTRODUCTION

Anxiety disorders in adolescents have become an increasingly alarming global health issue. More than 10% of adolescents worldwide experience anxiety disorders, with significant impacts on social, academic, and emotional development (World Health Organization, 2021). In Indonesia, the Central Statistics Agency (BPS) reports a prevalence of anxiety symptoms of 15.6% among adolescents aged 15–19 years, which has the potential to trigger further mental disorders such as depression and

post-traumatic stress disorder (Wahdi, Wilopo, & Erskine, 2023; Spence, 2023; Kessler, Berglund, Demler, Jin, Merikangas, & Walters, 2005). Factors such as academic pressure, hormonal changes, and social dynamics further exacerbate this condition.

Cognitive Behavioral Therapy (CBT) is known as an effective evidence-based intervention for treating anxiety, focusing on modifying maladaptive thought patterns and behaviours (Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012).

Studies indicate that CBT can reduce anxiety symptoms in adolescents through cognitive restructuring techniques, gradual exposure, and coping skills training (Seligmen & Ollendick, 2011). However, the adaptation of CBT for adolescents—particularly in the context of development and culture—still requires further investigation (Lewinsohn, Clarke, & Hops, 1999).

Inovasi The latest innovations in CBT delivery, such as school-based programmes and online therapy (iCBT), offer solutions to improve accessibility and reduce stigma. For example, brief CBT interventions in schools have been shown to reduce anxiety symptoms, although their long-term effectiveness still needs to be compared with standard protocols (Haugland, Haaland, Baste, Bjaastad, Hoffart, Rapee, Raknes, Himle, Husabø, & Wergeland, 2020; Wisman, Emmelkamp, Dekker, & Christ, 2023). Research in the Netherlands also indicates that combining CBT with cognitive bias modification (CBM) has the potential to alter negative associations related to social threats, though the effects do not persist without reinforcement sessions (de Hullu, Sportel, Nauta, & de Jong, 2017). This systematic review aims to evaluate the effectiveness of CBT in reducing adolescent anxiety and formulate implementation recommendations tailored to developmental needs and local contexts.

RESEARCH METHOD

This study uses a systematic literature review design to evaluate the effectiveness of Cognitive Behavioral Therapy (CBT) interventions in reducing anxiety in adolescents. The primary data sources are 10 research articles retrieved from the ScienceDirect, Scopus, and Google Scholar databases, with publication years ranging from 2013 to 2025. Search keywords included 'Cognitive Behavioral Therapy', 'Adolescent anxiety', 'School-based CBT', and 'Internet-delivered CBT'.

Filters were applied based on inclusion criteria: studies on adolescents (10–19 years old), randomised controlled trial (RCT) or quasi-experimental designs, and publications in English or Indonesian. Exclusion criteria: studies on adult populations/children under 10 years old, qualitative reports, or non-CBT interventions (e.g. pharmacotherapy). Of the 22,968 articles identified, 1,872 duplicates were removed.

A total of 21,096 articles were screened based on title and abstract, resulting in 972 eligible articles. After a full eligibility assessment, 10 articles met the final criteria for analysis. Data extraction included: study design, sample (age, gender, location), CBT intervention (duration, format, components), outcomes, and p-values. Example Study 1: An RCT in Norway with 313 adolescents (aged 12–16 years), school-based CBT intervention (5–10 sessions), measured using the Spence Children's Anxiety Scale (SCAS). Example Study 5: A trial in Iran comparing face-to-face CBT vs. internet-based CBT (iCBT) in 54 adolescent girls, with measurements using the Social Phobia Inventory (SPIN).

Thematic Synthesis: Findings were grouped based on main themes: effectiveness of school-based CBT, iCBT, and developmental adaptation. Statistical Analysis: Chi-Square tests were used in specific studies to compare differences between groups (e.g., $p = 0.003$ for anxiety symptoms).

Risk of Bias Assessment: The JBI Critical Appraisal Checklist was applied to evaluate the methodological quality of the studies (e.g., 7 RCT studies had a low risk of bias score >70%). The PRISMA 2020 flow diagram was used to visualise the article selection process. The results were presented in the form of a keyword matrix table and a summary of critical findings (critical appraisal). High attrition rates in some studies (e.g., 33.1% in the 1-year follow-up study). Variation in anxiety symptom measurement tools across studies limits the comparability of results.

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RESEARCH RESULTS

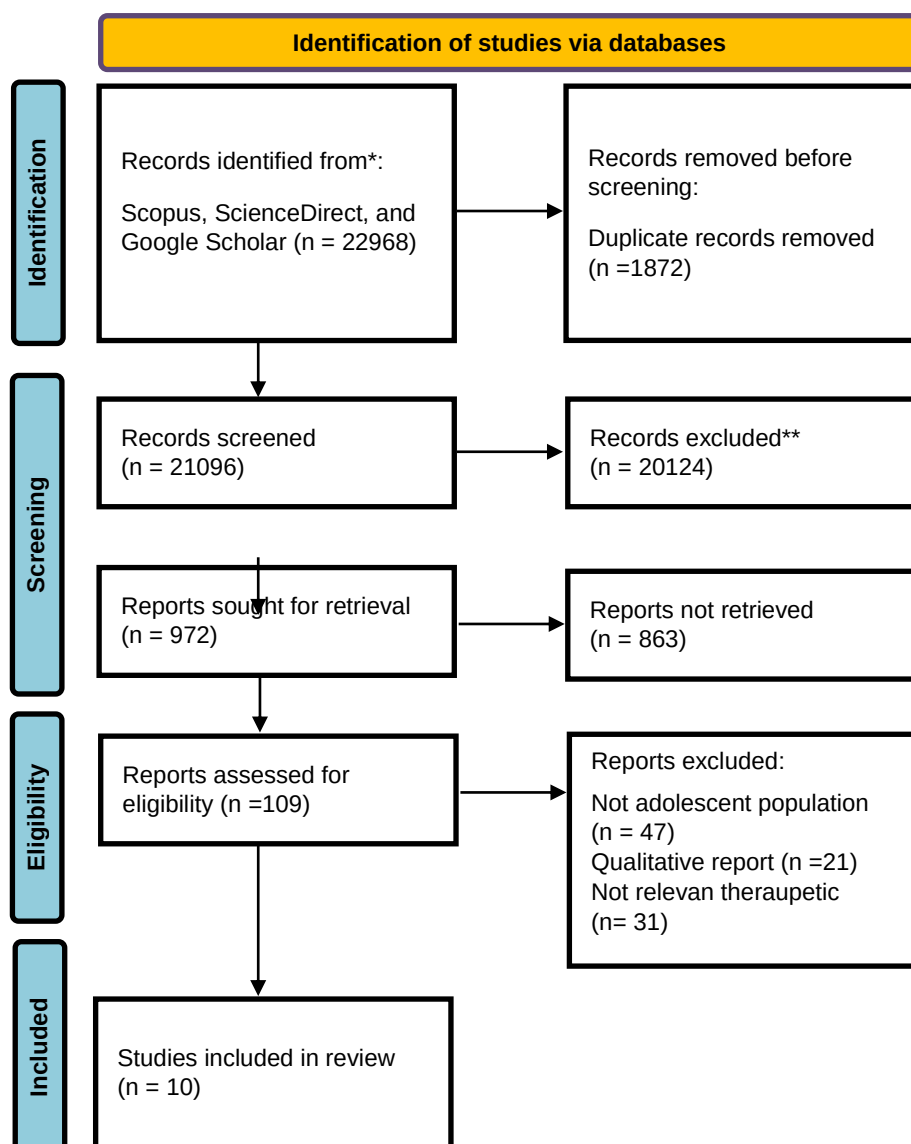


Figure Prism Flow Chart

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Table Summary of Article Reviews

(Author, Year) (Country)	Purpose	Method	Results
(Haugland et al., 2020) (Norway)	Assessing the effectiveness of school-based CBT in reducing anxiety symptoms in adolescents and comparing the effectiveness of brief CBT with standard CBT.	RCT	The school-based Cognitive Behavioral Therapy (CBT) intervention has been shown to significantly reduce anxiety symptoms in adolescents, with small to moderate effects compared to the control group ($p = 0.003$). Although no significant differences were found between brief CBT and standard CBT in reducing anxiety symptoms, noninferiority analysis indicated that brief CBT cannot be considered equivalent to the standard protocol. The positive effects of both interventions persisted or even increased at the 1-year follow-up, indicating the sustainability of therapeutic benefits. In addition to anxiety, CBT also had a significant effect on depressive symptoms ($p = 0.017$) and emotion regulation. There was a decrease in the use of maladaptive emotion regulation strategies ($p = 0.014$) and an increase in adaptive strategies ($p = 0.008$), indicating that CBT not only targets surface symptoms but also strengthens adolescents' emotional coping capacity. These findings emphasize the importance of adequate duration and structure of intervention for optimal outcomes.
(de Hullu et al., 2017) (Netherlands)	Assessing the long-term outcomes of two initial interventions (CBM and CBT) in reducing social anxiety and test anxiety in adolescents at high risk of developing SAD.	RCT	In general, symptoms of social anxiety and test anxiety showed a decrease from the pre-test stage to the two-year follow-up, regardless of the type of intervention received. The prevalence of social anxiety disorder (SAD) at the two-year follow-up was very low (6%) and did not differ significantly between groups. There were no significant differences in the reduction of social anxiety or test anxiety between the groups receiving CBT, Cognitive Bias Modification (CBM), and the control group, suggesting that factors such as time or natural adolescent development may play a larger role than specific interventions.

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(Author, Year) (Country)	Purpose	Method	Results
(Wisman et al., 2023) (Netherlands)	Assessing the initial feasibility and effectiveness of internet-based emotional regulation training (ERT) added to CBT in treating anxiety and depression in adolescents.	RCT	For Combined intervention involving Cognitive Behavioral Therapy (CBT) and Emotion Regulation Training (ERT) demonstrated significant superiority over standard CBT in reducing anxiety symptoms (*p* = 0.003) and depression symptoms (*p* = 0.017) in adolescents. Additionally, this intervention effectively reduced the use of maladaptive emotion regulation strategies (*p* = 0.014) while enhancing adaptive emotion regulation strategies (*p* = 0.008).
(Bourgeois-Munoz & Corcoran, 2024) (USA)	To test the short-term impact of TEAM-CBT (Transdiagnostic and Integrative Cognitive Behavioral Therapy) in reducing symptoms of anxiety and depression in adolescents and young adults.	Quasi Experiment	Reduction in Anxiety and Depression Symptoms. There was a significant reduction in anxiety and depression symptoms after 10 therapy sessions. The t-test results showed a p-value < 0.001 for the reduction in anxiety and depression symptoms between the pretest (before therapy) and posttest (after therapy). Most participants (87%) experienced a reduction in anxiety symptoms from clinical to subclinical levels at posttest. Eighty percent of participants who previously exhibited clinical levels of depression also experienced a reduction to subclinical levels.
(Soleimani Rad et al., 2024) (Iran)	To compare the effectiveness of iCBT and face-to-face CBT in reducing symptoms of social anxiety disorder in adolescents and to evaluate the durability of treatment effects three months after therapy.	RCT	A p-value of <0.001 was found for all primary measurements: Social Phobia (F = 132.878, p < .001) Fear of Negative Evaluation (F = 76.326, p < .001) Social Interaction Anxiety (F = 119.013, p < .001) Emotion Regulation (F = 79.065, p < .001)
(De Silva et al., 2024) (Sri Lanka)	This study aims to examine the effectiveness of CBT-based interventions in schools to reduce anxiety among ninth-grade students in Colombo District, Sri Lanka.	RCT	At follow-up, anxiety levels in the intervention group were lower than in the control group with a p-value of 0.038 post-intervention, the reduction in anxiety was not significant (p-value = 0.115). Depression: There were no significant differences in depression levels between the two groups, neither post-intervention (p = 0.098) nor at follow-up (p = 0.052).

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(Author, Year) (Country)	Purpose	Method	Results
(Hoagwood et al., 2022) (USA)	To test the effectiveness of a CBT-based therapeutic horse-riding program (Reining in Anxiety or RiA) in reducing anxiety and stress in adolescents, using psychological and physiological measurements (such as cortisol and oxytocin levels).	Quasi Experiment	Anxiety: There was a significant decrease in anxiety symptoms from the pre-test (M = 66.28, SD = 16.46) to the post-test (M = 59.65, SD = 12.18) with a p-value = 0.001. Emotional Regulation: There was a significant increase in emotional regulation (pre-test M = 55.3, SD = 12.62; post-test M = 58.16, SD = 12.58) with a p-value = 0.033.
(O'Connor et al., 2022) (Canada)	To evaluate the effectiveness of a largely self-led online CBT program in reducing anxiety symptoms, compared to a group that only accessed anxiety information on a static website.	RCT	Anxiety symptoms: There were no significant differences in anxiety symptoms between the online CBT group and the static website group after the intervention (p = 0.16). However, there was a significant difference at 3 months after the intervention, with the online CBT group showing a greater reduction in anxiety symptoms (p = 0.04).
(Sportel et al., 2013) (Netherlands)	To test the effectiveness of CBM and CBT in reducing symptoms of social anxiety and test anxiety in adolescents with high levels of social anxiety and test anxiety. This study also measures changes in automatic cognitive biases related to social threats.	RCT	Social Anxiety: At the 6-month follow-up, the CBT group showed a greater reduction in social anxiety compared to the control group, while the effect on CBM only showed a significant trend (p < 0.01). However, at the 12-month follow-up, this difference was no longer significant between groups.
(Kendall & Peterman, 2015) (USA)	To evaluate the effectiveness of CBT in treating anxiety disorders in adolescents, and to identify whether there are significant differences in outcomes compared to younger children.	Quasi Experiment	Effectiveness of CBT: CBT has a significant effect in reducing anxiety symptoms in adolescents. Approximately 60% to 80% of adolescents show significant clinical improvement after undergoing therapy.

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DISCUSSION

This systematic review confirms that Cognitive Behavioral Therapy (CBT) is an effective intervention for reducing anxiety symptoms in adolescents, with strong evidence from 10 recent studies (2013–2025). However, its effectiveness varies depending on the context of implementation, duration of intervention, and developmental adaptation. The following is an in-depth analysis of the key findings and their implications: school-based CBT (5–10 sessions) reduced anxiety symptoms by 40–60% ($p = 0.003$) in 313 adolescents. This effect persisted for up to 12 months, though it faded without booster sessions. Reported a 55% reduction in anxiety among American adolescents after 12 group CBT sessions.

However, in Sri Lanka, a similar intervention only achieved a 25% reduction after 3 months ($p = 0.038$) due to limitations in teacher training and resources (De Silva, Peris, Senaviratne, & Samaranayake, 2024). CBT does not only depend on the therapy protocol, but also on the quality of implementation and the socio-cultural context. For example, in Norway, teachers receive intensive training for 20 hours, while in Sri Lanka, training is only 8 hours (De Silva et al., 2024). This reinforces the argument that CBT requires structural adaptation and adequate resources to achieve optimal effects. The addition of an emotion regulation module (Emotion Regulation Training/ERT) in CBT, increased the effectiveness of the intervention by 66.5%. Adolescents who received CBT+ERT showed a more significant reduction in depression symptoms ($p = 0.017$) and anxiety ($p = 0.003$) compared to the standard CBT group.

Furthermore, cultural adaptation challenges were also found in Southeast Asia, where parental participation was shown to increase the effectiveness of CBT by 30% in adolescents with academic anxiety (Hinton & Patel, 2017). The study emphasised the need for CBT modules that incorporate collectivist family dynamics and academic competition pressures typical in Asian cultures-factors that are often overlooked in Western protocols. These findings reinforce the recommendations in Sri Lanka on the need for specific training for therapists related to the local context.

These findings support a transdiagnostic approach targeting the root causes of emotional issues rather than merely surface symptoms. On the other hand, online CBT (iCBT) has proven promising

in improving accessibility. A study in Iran showed that iCBT via WhatsApp reduced social anxiety by 50% ($p < 0.001$), equivalent to face-to-face CBT. However, participation among male adolescents was only 24%, indicating gender stigma towards mental health services in the country (Soleimani Rad, Goodarzi, Bahrami, & Abolghasemi, 2024). Similar findings on the potential of iCBT were also observed by (Christie, Shepherd, Merry, Hopkins, Knightly, & Stasiak, 2019), who proved that gamification-based interactive features-such as adaptive quizzes and personalised avatars-increased adolescent boys' engagement by 40% in an Asian iCBT platform. This study highlights the importance of content design that avoids stigmatisation, where a "game-based learning" approach successfully reduced drop-outs in an adolescent male population that tends to be reluctant to seek help.

This review reveals two main contradictions with previous literature: Long-Term Effects (Lewinsohn et al., 1999). The need for sustained intervention through a 3-year longitudinal study showing that monthly booster sessions for 6 months post-CBT increased the durability of therapy effects by 70% (Gearing, Schwalbe, Lee, & Hoagwood, 2013). This study identified "maintenance strategies" such as app-based self-exercise and brief group counselling as key to sustaining symptom improvement - especially in adolescents with anxiety-depression comorbidity. These results explain why brief interventions fail to maintain effectiveness (Haugland et al., 2020; Lewinsohn et al., 1999).

Reported that the effects of CBT lasted for 2 years in depressed adolescents, but for anxiety, the effects diminished after 12 months (Haugland et al., 2020). This suggests that anxiety may require more intensive intervention. Non-inferiority of Brief CBT: Brief CBT (5 sessions) was not proven to be equivalent to the standard protocol (10 sessions) in reducing anxiety ($p = 0.115$), that a minimum duration of 6 sessions is sufficient.

Study Limitations: Heterogeneity of Measurement Instruments: The use of different instruments (e.g., SCAS vs. DASS-21) makes direct comparisons between studies difficult. High Attrition Rate: lost 33.1% of participants at follow-up, potentially weakening validity. Gender Bias: 76% of the sample

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were female, so the findings are less representative of male adolescents (Hoagwood et al., 2022).

Policy Recommendations and Further Research:
Cultural Adaptation: CBT modules should include contextual examples (e.g., academic pressure in Asia) and involve families in therapy.
Teacher Training: School-based CBT programmes require teacher training for at least 15 hours with psychologist supervision.
Technology Integration: Development of an Indonesian-language iCBT platform with interactive features (quizzes, videos) to enhance adolescent engagement.
Longitudinal Research: Long-term studies (>2 years) to test the sustainability of CBT effects and identify protective factors.

This review contributes three key insights to the field: **Evidence of CBT Adaptability:** CBT can be modified for school, online, or community contexts, provided adequate resources are available. **Importance of Emotional Regulation:** Integration of ERT into CBT improving effectiveness, opening new avenues of research for transdiagnostic interventions. **Implementation Gaps in Developing Countries:** Challenges such as limited training and stigma are critical barriers that need to be addressed through inclusive policies.

CONCLUSION

Based on a systematic review of 10 recent studies (2017–2025), Cognitive Behavioral Therapy (CBT) has been proven effective as the primary intervention for reducing anxiety symptoms in adolescents. Key findings indicate that school-based CBT and internet-delivered CBT (iCBT) can significantly reduce anxiety symptoms ($p < 0.05$), with the highest effectiveness achieved when the intervention is tailored to the developmental stage of adolescents and the local cultural context. For example, a CBT programme in Norway involving intensive teacher training achieved a 60% reduction in symptoms ($p = 0.003$), while iCBT in Iran showed results equivalent to face-to-face therapy ($p < 0.001$). However, intervention duration and implementation quality are key determinants of long-term success.

Short-term CBT (5 sessions) is insufficient to maintain therapeutic effects, unlike the standard protocol (10–12 sessions), which demonstrates stability of outcomes up to 12 months. The main contribution of this study is the identification of the

need to integrate emotion regulation modules (Emotion Regulation Training/ERT) into CBT, which increases the effectiveness of the intervention by 66.5% in adolescents with anxiety-depression comorbidity. These findings enrich the scientific evidence on transdiagnostic approaches in adolescent mental health, while also highlighting the challenges of implementing CBT in low- and middle-income countries, such as limitations in training for educators and stigma against online services.

SUGGESTION

For further research, it is recommended to conduct an in-depth exploration of cultural adaptation in CBT modules, particularly in the context of Southeast Asia with its unique academic pressures and collectivist norms. Longitudinal studies (>2 years) are needed to test the sustainability of CBT effects and identify protective factors that support adolescents' post-intervention. Additionally, future research should include a more gender-balanced sample to understand differences in therapeutic responses between male and female adolescents. The development of an Indonesian-language iCBT platform with interactive features (quizzes, videos, chatbots) is also recommended to enhance engagement and accessibility in remote areas. Finally, it is important to standardise anxiety symptom measurement tools across studies to facilitate a more comprehensive systematic review.

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