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Review Article

The Effect of Cognitive-Behavioral Therapy on Reducing Symptoms and Negative Consequences of Internet Addiction in Adolescents: A Systematic Review and Meta-Analysis

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Abstract

Background and aims: Internet addiction among adolescents has become an increasingly important public health concern worldwide. This study examined the effectiveness of cognitive-behavioral therapy (CBT) in reducing the symptoms and negative consequences of internet addiction in adolescents.

Methods: A systematic search was conducted in English, Persian, and other languages for clinical and experimental studies published between 2000 and 2025 on adolescents aged 13–18 years with internet addiction, focusing on CBT-based interventions. Eligible studies compared CBT with control or non-addicted groups and reported outcomes related to reductions in social media addiction. Two independent reviewers screened studies, extracted data, and assessed methodological quality using the Consolidated Standards of Reporting Trials (CONSORT) checklist. Publication bias was evaluated using the Egger test. Primary outcomes were analyzed using a random-effects model in Stata 17 to account for expected heterogeneity.

Results: This meta-analysis of nine studies found that CBT significantly reduces internet addiction in adolescents (SMD = 1.05, $P = 0.003$), although results varied widely across studies ($I^2 = 94.4\%$). Individual CBT interventions were consistently effective, while group-based interventions demonstrated greater variability and, in some cases, less significance. Experimental studies yielded more reliable positive effects than clinical trials. Secondary outcomes revealed only modest reductions in overall time spent online following group CBT. Meta-regression analyses did not explain the high heterogeneity, indicating that unmeasured factors may influence outcomes. No significant publication bias was detected, supporting the robustness of the findings.

Conclusion: CBT effectively reduces internet addiction among adolescents; however, more standardized, high-quality studies are needed to optimize interventions.

Keywords: Cognitive-behavioral therapy, Internet addiction, Adolescents

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Introduction

Behavioral addictions, newly recognized as mental disorders in the 11th edition of the International Classification of Diseases (ICD-11), indicate that human behavior itself can become addictive, similar to substance-related disorders.[1]

Among these, Internet Use Disorders (IUDs), including Internet Gaming Disorder and non-gaming Pathological Internet Use, are growing at an alarming rate. Internet addiction in adolescents aged 13 to 18 has emerged as a significant mental health challenge in recent years, with a wide range of adverse effects on physical health, psychological well-being, and social functioning.[2]

IUDs, including Internet Gaming Disorder and non-gaming Pathological Internet Use, are currently growing at an alarming rate. Internet addiction among adolescents aged 13 to 18 has emerged as a major mental health concern over the past decade, negatively affecting physical health, psychological well-being, and social functioning in this age group. One of the practical therapeutic approaches

in this area is cognitive-behavioral therapy (CBT), which aims to modify maladaptive thoughts and behaviors while enhancing coping skills.[3]

Recent studies indicate that CBT, whether delivered in person or via videoconferencing, can significantly reduce symptoms of internet addiction and decrease the amount of time adolescents spend online.[3]

According to a recent systematic review of international studies, CBT and CBT-based interventions not only reduce the core symptoms of internet addiction but also improve co-occurring psychological issues such as anxiety and depression.[4] Additionally, some studies have highlighted the effectiveness of family interventions and parent training programs grounded in CBT principles. These approaches can have an indirect yet significant impact on reducing internet addiction in adolescents by improving parent-child relationships and enhancing parenting skills.[5]

Although some studies have methodological limitations such as small sample sizes or the lack of control groups, the existing evidence suggests that CBT, particularly when applied within structured programs involving family participation, is one of the most effective therapeutic strategies for managing and preventing internet addiction in adolescents.[6]

In summary, recent research demonstrates that CBT, as a scientifically grounded and structured therapeutic approach, can effectively reduce symptoms and negative consequences of internet addiction in adolescents aged 13 to 18.[7] By targeting maladaptive thoughts and behaviors, enhancing coping skills, and, when appropriate, involving family members, CBT not only helps reduce internet dependency but also improves adolescents' mental health and quality of life. Therefore, implementing CBT, particularly within comprehensive, evidence-based programs, can be a highly effective and recommended strategy for addressing internet addiction in this age group.

Materials and Methods

Review Question

Does cognitive behavioral therapy affect side impact addiction in adolescent groups?

Search Strategy

The protocol of this article was registered in the Open Science Framework (OSF).[8] The search was conducted in both English and Persian. Inclusion criteria focused on adolescents aged 13 to 18 years diagnosed with IUD. Eligible studies included both sexes aged 13 to18 years: Intervention)CBT), Comparison (Pre- and post-intervention assessment with a control group or non-addiction group/ Outcomes (reduction in internet or social media addiction), Study Design (clinical trial or experimental study published between 2000 and 2025.

The search strategy was applied across PubMed, Scopus, Web Of Science using the following terms and their combinations: (Cognitive Behavioral Treatment) OR (CBT) AND (Internet Uses) OR (Use, Internet) OR (Internet Usage) OR (Usage, Internet) OR (Web Usage) OR (Usage, Web) OR (Web Use) OR (internet addiction) AND (Adolescent) OR (13 to 18 years of age) AND (("2000"[Date - Create]: "2025" [Date - Create]). Finally, we examined additional sources of gray literature, including conference papers and key academic journals (Figure 1).

The date range from 2000 to 2025 was applied appropriately according to each database's syntax and filtering options. In PubMed, the date limits were set using ("2000" [Date - Create]: "2025" [Date - Create]), while in Scopus and Web of Science, built-in date filters were used to restrict the search to the specified period. Finally, additional gray literature sources, including conference proceedings and relevant academic journals, were also reviewed to ensure comprehensive coverage of eligible studies (Figure 1).

Screening and Data Extraction

Two researchers independently screened the titles and abstracts, and no discrepancies were encountered during the initial stage. Using a standardized Excel template, both researchers independently screened titles and abstracts, and any disagreements were resolved through discussion until consensus could not be reached. When consensus could not possible, a third reviewer served as an adjudicator. Data extraction was conducted independently by the same two reviewers, and discrepancies were resolved in a similar manner. The information collected encompassed three main categories:

(a) Study identification details (including the title, first author, and year of publication),
(b) Methodological features (such as study design, sample size, participant demographics including age and gender, intervention strategies, validated assessment tools, and quality appraisal),
(c) The primary findings reported in each study.

Risk of Bias (Quality) Assessment

The quality of the included studies was evaluated using the Consolidated Standards of Reporting Trials (CONSORT) Statement, which was specifically designed for randomized trials of non-pharmacologic treatments. Two reviewers independently completed the assessment checklist for each study, and any discrepancies were resolved through discussion and consensus.[10] In addition, the certainty of the evidence for each outcome was evaluated using the Grading Of Recommendations Assessment (GRADE) approach.

2.5. Publication Bias

Publication bias was assessed using the Egger test.[11] A one-tailed significance level of $\alpha = 0.05$ was applied to evaluate the intercept. The Egger method was used to detect and, when necessary, adjust for potential publication bias by estimating the impact of missing studies and incorporating them into the overall effect size calculation.[12]

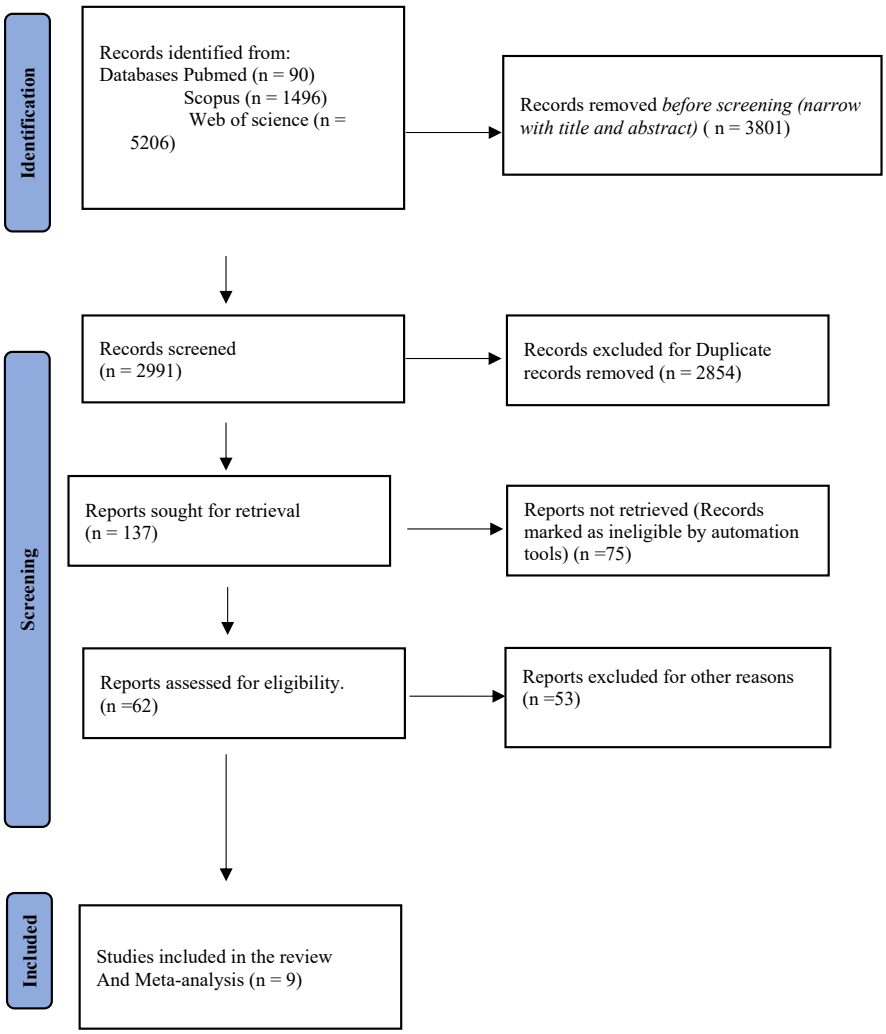

Figure 1. PRISMA 2020 Flow Diagram for New Systematic Reviews Including Searches of Databases[9]

Statistical Analysis

The primary outcome in this review was the effect of CBT on adolescents' internet addiction, while the secondary outcome focused on changes in time spent online. Given the anticipated substantial heterogeneity, heterogeneity was assessed using the I^2 statistic, a standard measure of inconsistency and heterogeneity, heterogeneity in meta-analyses.[13] Specifically, I^2 was used to quantify the degree of heterogeneity, and a random-effects model was applied to account for expected variability across studies.[14] Due to the substantial heterogeneity observed ($I^2 = 94.4\%$) among the included studies, predefined subgroup analyses were conducted based on the type of CBT intervention (individual vs. group) and the study design (experimental vs. clinical).

The standardized mean difference (SMD) was used as the effect size metric to quantify the magnitude of CBT's effect across studies with different measurement scales. A random-effects meta-analysis model was applied to pool the results, accounting for between-study variation. Sensitivity analyses were considered; however, their implementation was limited by the small number of included studies. All statistical analyses were conducted using Stata version 17.

Results

Characteristics of Studies

Out of the total number of related articles identified through the systematic search, nine studies met the inclusion criteria, and they are reported in Table 1.[15-23] Overall, the findings demonstrated that CBT had a significant impact on reducing Internet Addiction in adolescents (Table 1).

Quality Assessment of Included Studies

About 25% of the included studies had a moderate risk of bias, while the remaining studies demonstrated a low risk of bias. In all studies, clearly defined primary outcomes and general interpretations of results were reported during the research, representing the strongest quality criteria for the assessed studies (Table 2).

Results of the Meta-Analysis on the Effect of Cognitive-Behavioral Therapy on Adolescents' Internet Addiction

The pooled standardized mean difference (SMD) was 1.05 (95% CI: 0.36-1.74), indicating a statistically significant effect ($P = 0.003$).

Some studies demonstrate strong positive effects (SMD ≈ 6.10),[18] while others reported a significant adverse effect

Table 1. Characteristics of Included Studies

Author, Year	Sample Size	Design	Mean Age	Target Groups	Duration of Therapy	Type of Intervention	Questionnaire	Key Findings
Carolin Szasz-Janocha, 2020[15]	54	RCT	13.48 (*SD* =1.72)	Self-reported or parent-reported excessive gaming or Internet use	12 months	CBT-based group intervention	(PIUQ, Children's Depression Inventory,	Manual-based CBT or CBT for adolescents with IUD resulted in medium to large, clinically significant improvements in IUD symptoms and associated comorbidities over 12 months.
Liu et al, 2015[16]	46	Clinical trial	Aged 12–18 years	Adolescents' Internet addiction		MFGT	Adolescent AIQ	Time spent on the Internet In the intervention group, the decline was also significant throughout the intervention until the three-month follow-up. Six-session MFTG significantly reduced adolescent Internet addiction, decreasing prevalence from 100% at baseline to 11.1%, with effects maintained at 3-months follow-up.
Guek Nee, 2017[17]	157	Experimental design	Aged 12–18 years	Internet Use for Youth	3 months	CBT	Problematic AIT	The majority of participants demonstrated significant and enduring improvements in problematic internet use, social anxiety, and social interactions following the PIP-IU-Y intervention.
Jasuma et al, 2023[18]	24	Experimental design	Aged≥17 years	Students		CBT group counseling with an assertive technique	Social Networking Addiction Scale	Both CBT methods were effective in reducing students' social media addiction.
Lindenberg, 2022[19]	422	Cluster Randomized Clinical Trial	15.11 [2.01]	At-risk adolescents with gaming disorder and unspecified internet use disorder	10 Sessions	Theory-driven, manualized CBT–based indicated preventive group intervention	Computer Game Addiction Scale	The gradual improvement observed among PROTECT participants, compared with the control group, resulted in a 39.8% reduction in symptoms over 12 months, whereas the control group experienced a 27.7% reduction. The effect size for the PROTECT group was Cohen's d=0.67.
Ahmadi, 2022[20]	30	Experimental design	Aged 15–18 years	Boys' student	12 Months	Mindfulness -Based Cognitive Therapy (MBCT)	Young Internet Addiction Questionnaire (IAQ)	Based on the results, it can be concluded that mindfulness-based cognitive group counseling is an effective intervention for reducing Internet addiction and procrastination-related education among high school students.
Pourrosta et al, 2024[21]	45	Experimental design	Aged 15–18 years	Boys' Internet addiction	10 sessions	Cognitive-behavioral therapy	Internet Addiction Test	Therapists can utilize CBT and positive psychology interventions as effective treatment methods for Internet addiction and the prevention of risky behaviors.
Kafnia, 2019[22]	40	Experimental design	Aged 15–18 years	Girls' Internet addiction	9 sessions	Group CBT	IAQ	CBT reduced students' internet addiction and enhanced their communication skills.
Du et al, 2010[23]	56	RCT	Aged 12–17 years	Adolescent students with Internet addiction	8 sessions	Multimodal school-based group CBT	Internet veruse Self-Rating Scale, Time Management Disposition Scale, and Beard's Diagnostic Questionnaire for Internet Addiction	Multimodal school-based group CBT is effective for adolescents with Internet addiction, particularly in improving emotional state, regulation ability, behavioral, and self-management skills.

Note. RCT: Randomized controlled trial; SD: Standard deviation; CBT: Cognitive behavioral therapy; IUD: Internet use disorder; PIUQ: Problematic Internet Use Questionnaire; MFGT: Multi-family group therapy; PIP-IU-Y: Program for Internet problems – Internet use for youth; MBCT: Mindfulness-based cognitive therapy; IAQ: Internet Addiction Questionnaire; IAT: Internet addiction test.

(SMD = -3.43).[22] Overall, the results suggest a significant positive impact of CBT, despite substantial heterogeneity across studies. The large effect size and statistical significance indicate that the intervention or comparison being evaluated yields a notable difference across studies (Figure 2). To identify the sources of heterogeneity and address the high heterogeneity, meta-regression was performed to examine relationships between continuous

Table 2. Quality Assessment of Included Studies

Questions	Szász-Janocha, 2020[15]	Liu et al, 2015[16]	Guek Nee, 2017[17]	Jasuma et al, 2023[18]	Lindenber et al 2022[19]	Ahmad, 2022[20]	Pourrosta et al, 2024[21]	Kafnia, 2019[22]	Du et al, 2010[23]
Participants (eligibility)	1*	1	1	1	1	1	0*	1	1
Intervention (clearly defined)	1	0	0	1	1	1	1	1	1
Primary outcome (clearly defined)	1	1	1	1	1	1	1	1	1
Number analyzed reported	1	1	0	1	1	1	1	1	0
Conclusion (general interpretation)	1	1	1	1	1	1	1	1	1
Results**	High quality	High quality	Moderate quality	High quality	High quality	High quality	Moderate quality	High quality	High quality

Note. *0: No; 1: Yes; ** Results: High quality of assessment (score = 5,4), Moderate quality of assessment (score = 2,3), low quality of assessment (1,0).

Figure 2. Subgroup Analysis of the Type of Intervention and Design of Studies

variables and treatment effects, while subgroup analyses categorize studies based on relevant methodological and intervention characteristics (Figure 2, Part A).

Subgroup Analysis

To reduce heterogeneity, subgroup analyses were conducted based on the type of intervention (CBT-based group intervention and CBT-based individual) and study design (clinical trial vs. experimental design).

The results indicated different patterns of heterogeneity and effectiveness among CBT approaches. The marked difference in Tau^2 values between the CBT-based group interventions and CBT-based individual interventions (1.60 vs. 0.06) suggests that heterogeneity within CBT is likely due to conceptual and methodological differences rather than statistical errors. Therefore, a qualitative synthesis may be more appropriate for evaluating variations in therapeutic approaches within CBT rather than quantitative analysis.

The results suggest that CBT-based individual interventions consistently show significant positive effects, whereas group interventions demonstrate more variable outcomes. The high heterogeneity in the group interventions indicates that individual studies exhibit varying effectiveness, which may necessitate further exploration of the factors contributing to these differences. Overall, CBT exerts a positive effect when all individual studies are considered collectively (Figure 2- Part B).

Analysis of subgroup differences based on the study design (clinical trials vs. experimental designs) reveals that, although the overall pooled effect of interventions is statistically significant (SMD = 1.054, 95% CI: 0.367-1.741), clinical trials indicate high variability and do not yield substantial results individually. Conversely, experimental studies show more consistent, significant positive effects. The substantial heterogeneity, especially in clinical trials, suggests that methodological differences and population variations across studies may lead to inconsistent findings, warranting further investigation to understand the contributing factors (Figure 2- Part C).

Secondary Outcome

While the secondary outcome, which focused on changes in time spent online, one study assessed the change in the measured variable (likely time spent on the Internet or a related behavioral score) before and after a CBT-based group intervention. In this study, the mean score decreased modestly from 4.14 (SD = 2.30) at baseline to 3.87 (SD = 2.61) after the intervention among 52 participants[15]. Although this reduction suggests a modest improvement following the intervention, the change was relatively small and not reported as statistically significant. Additionally, the increase in standard deviation post-intervention indicates slightly greater variability in participants' responses. These results imply that while the CBT-based group intervention may contribute to a reduction in problematic online behavior, the effect size is limited, and individual responses vary considerably.

Meta-regression

The meta-regression included 10 observations and explored relationships between effect sizes (ES) and study-level characteristics (SS). This constant represented the estimated effect size when SS is zero and was not statistically significant ($P = .214$). The coefficient for SS was -.001, with a confidence interval crossing zero (-0.016-0.013). The meta-regression results suggest that SS does not significantly predict the ES across the studied interventions. The high degree of heterogeneity indicates that this model does not capture other influencing factors of treatment outcomes. Additionally, the negative adjusted R^2 suggests that the chosen predictor does not improve model fit and cannot be explained by sample size alone. Overall, the findings imply the need for further investigation into potential variables or models that better account for the observed variations in ESs.

Sensitivity Analysis

The leave-one-out sensitivity analysis indicated that omitting any single study, except Study 9, did not significantly alter the overall pooled ES estimate (Hedges' g). The overall random-effects estimate was 0.73 with a 95% CI that included zero, indicating a non-significant effect (95% CI: -0.36 to 1.82, $P = 0.189$). Notably, omitting Study 9 increased the ES to approximately 1.00, with the confidence interval no longer including zero ($P = 0.047$), resulting in a statistically significant effect. Removal of Studies 4 and 5 reduced the pooled ES, suggesting that the meta-analysis results are generally robust. However, Study 9 substantially influenced the precision and statistical significance of the overall estimate and therefore warrants further scrutiny.

Publication Bias

The results of Egger's test indicated no significant evidence of small-study effects or publication bias in this meta-analysis. Although the positive slope indicated a potential relationship between the standard error and ESs, the lack of statistical significance suggested that this relationship was weak and unreliable. Overall, Egger's test supports the conclusion that small studies do not distort the results of meta-analysis ($P = 0.08$, 95% CI: -0.17-2.45).

Egger's test showed no evidence of publication bias, but the trim-and-fill method identified publication bias due to funnel plot asymmetry and adjusted the overall effect accordingly. This discrepancy may be due to differences in the statistical assumptions of the two methods, varying sensitivity to heterogeneity, data characteristics (such as heterogeneity), or the possibility of unpublished studies.[24]

According to the meta-analysis results, the fixed-effects model produced a pooled ES of 1.063 (95% CI: 0.924-1.202), while the random-effects model produced an estimate of 1.054, with a notably wider confidence interval (0.367- 1.741). Both models indicated statistically

significant effects. The Q test for heterogeneity was highly significant (Q = 161.591, $P = 0.000$), indicating substantial variation among studies and suggesting the random-effects model as the more appropriate approach. After correction for publication bias using the trim-and-fill method, the fixed-effects estimate decreased to 1.029, while the random-effects estimate declined to 0.679, which was no longer statistically significant ($P = 0.051$). These findings underscore the presence of publication bias and substantial heterogeneity across studies; therefore, the results should be interpreted with caution.

Assessment of Methodological Quality of the Nine Studies

According to the GRADE framework, the certainty of evidence for the primary outcome, reduction of Internet addiction symptoms, was rated as moderate, mainly due to very high heterogeneity and several reporting concerns identified through the CONSORT checklist. The certainty of evidence for the secondary outcome, reduction in time spent online, was rated as low due to inconsistent findings across studies and imprecision from small sample sizes (Table 3).

Discussion

The meta-analysis of nine studies examining the effect of CBT on adolescent Internet addiction found a significant overall positive effect (pooled SMD = 1.05, 95% CI: 0.36–1.74, $P = 0.003$). However, the analysis revealed extremely high heterogeneity ($I^2 = 94.4\%$). Subgroup analyses revealed that individual CBT interventions consistently produced significant positive outcomes, while group-based interventions showed non-significant improvements and greater variability. Similarly, studies with experimental designs exhibited more consistent positive effects than clinical trials, suggesting greater variability. Secondary outcomes indicated only modest reductions in time spent online following group CBT, with considerable individual variation. Meta-regression did not identify significant predictors of ES, suggesting that unmeasured factors contribute to the observed heterogeneity. Importantly, no significant publication bias was detected, supporting the reliability of the overall findings.

CBT is widely regarded as the most effective psychological intervention for adolescent Internet addiction compared with alternative treatments. Meta-analyses and randomized controlled trials consistently show that CBT produces a larger ES in decreasing internet addiction symptoms than mindfulness-based interventions, psychoeducation, and pharmacological treatments, which typically produce small to moderate effects.[25] CBT's strengths lie in its structured approach to targeting maladaptive thoughts and behaviors, promoting emotional regulation, enhancing time-management strategies, and strengthening social functioning, often yielding sustained improvements over time.[26] Comparative studies further indicate that CBT outperforms general counseling in reducing Internet addiction symptoms.[27] Moreover, CBT is generally preferred over pharmacotherapy due to its non-invasive nature and adaptability to group or individual formats, whereas pharmacological interventions have shown mixed results.[28] Overall, CBT stands out as the leading evidence-based treatment for adolescent Internet addiction, especially when combined with parental involvement and tailored to individual needs.

The high variability in study outcomes, despite significant overall effects of CBT on adolescent Internet addiction, can be attributed to several factors. First, heterogeneity in study designs, participant characteristics, and intervention protocols contributes substantially to inconsistent results; studies vary in CBT delivery format (Individual vs. group), duration, and intensity, as well as in the severity and types of Internet addiction targeted.[29] Second, cultural and contextual variations among study populations influence treatment responsiveness, as patterns of internet use and manifestations of addiction differ across regions and cultures.[30] Third, while some studies report substantial positive effects, others even report adverse effects, reflecting differences in methodological rigor, sample sizes, and outcome measures. Additionally, small sample sizes and potential publication bias can inflate effect estimates and further increase variability.[31] To address these issues, meta-regression and subgroup analyses were necessary to identify moderators, such as intervention characteristics, that help explain heterogeneity and clarify CBT's true efficacy. Thus, although CBT shows promise, the considerable variability underscores the need for more standardized, high-quality trials to establish consistent, generalizable conclusions.

Meta-regression is a valuable tool for identifying key variables that may influence CBT effectiveness by statistically examining the relationships between study-level characteristics and observed ESs. In our analysis, we conducted a meta-regression using 10 observations to assess whether the SS variable, such as sample size, could explain variability in ESs across interventions. However,

Table 3. Summary of Findings and Certainty of Evidence (GRADE)

Outcome	No. of Studies	Pooled Effect (SMD, 95% CI)	Certainty of Evidence (GRADE)	Reasons for Downgrading
Reduction in Internet addiction symptoms	9 studies	1.05 (0.36 – 1.74), $P = 0.003$	Moderate ⬇	Downgraded for inconsistency (very high heterogeneity, $I^2 = 94\%$) and reporting concerns per CONSORT
Reduction in time spent online	1 study	Score decreased from 4.14 (SD = 2.30) to 3.87 (SD = 2.61)	Low ⬇⬇	Downgraded for inconsistency (variable findings) and imprecision (small sample sizes).

Note. GRADE: Grading of recommendations assessment; development and evaluation; SMD: Standardized mean difference; CI: Confidence Interval; SD: Standard deviation; CONSORT: Consolidated standards of reporting trials.

the results indicated that SS was not a significant predictor of ES (coefficient = -0.001, 95% CI: -0.016-0.013, $P = .214$), and the model's negative adjusted R^2 suggests that it did not improve model fit. The high degree of heterogeneity observed implies that factors beyond those included in the current model are influencing outcomes. These findings highlight the complexity of treatment response in adolescent Internet addiction and underscore the need for further research to identify additional moderators or adopt alternative models that may better account for the observed variation in ESs, ultimately guiding the optimization of future interventions.[31, 32]

High heterogeneity in study outcomes implies that the effectiveness of CBT for adolescent Internet addiction may vary widely depending on factors such as participant characteristics, intervention duration, cultural context, and specific treatment components.[33] This variability challenges the direct application of average research findings to real-world settings, indicating that clinicians should tailor CBT approaches to individual needs and local conditions rather than relying on a one-size-fits-all model.[34] It also highlights the importance of ongoing assessment and adaptation in practice to optimize treatment outcomes for diverse adolescent populations.

Based on all information provided, the main strengths of our meta-analysis are as follows: it includes a comprehensive review of nine studies, employs subgroup and meta-regression analyses to explore differences, finds that most included studies have a low risk of bias, detects no significant publication bias, and offers clear clinical recommendations for tailoring CBT to individual needs. However, the study also has notable weaknesses, including substantial heterogeneity across the included studies, the inability of meta-regression to explain this heterogeneity, and differences in study design and cultural context that limit the generalizability of the findings.

Revised Overall Implication

While the current evidence indicates that CBT can be beneficial for reducing Internet-related problems among adolescents, the certainty of these findings is limited. According to our GRADE appraisal, confidence in the overall effects was downgraded due to substantial heterogeneity across studies, small sample sizes, and reporting limitations identified through the CONSORT checklist. Therefore, conclusions should be interpreted with caution. Future research should prioritize high-quality, adequately powered randomized controlled trials, use standardized CBT protocols with precise implementation fidelity, and adopt consistent, validated outcome measures to provide more definitive evidence.

Conclusion

In reducing Internet addiction among adolescents, the current meta-analysis provides evidence that CBT is effective, with multiple randomized controlled trials and comparative studies supporting this conclusion. Individual CBT interventions consistently yield stronger and more reliable outcomes than group-based approaches, and experimental designs demonstrate greater effect consistency than clinical trials, although substantial heterogeneity remains. To address this variability, subgroup analyses and meta-regression were conducted to explore potential moderators. Although these analyses did not identify clear predictors, their application highlights the need for more detailed reporting and greater consideration of factors such as intervention format, participant characteristics, cultural context, and implementation fidelity. Importantly, the absence of significant publication bias and the robust overall ES confirm CBT's standing as a leading evidence-based intervention for adolescent Internet addiction, particularly when tailored to individual needs and supported by continuous monitoring and adaptation. Future research should prioritize standardized intervention protocols, rigorous methodological designs, and systematic investigation of potential moderators to optimize treatment outcomes across diverse settings.

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Competing Interests

The authors declare no conflict of interests.

Ethical Approval

Since this is a systematic review and meta-analysis involving no primary data collection from human participants, no ethical approval or institutional review board (IRB) code was required.

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References

1. Almeida MS, de Sousa Filho LF, Rabello PM, Santiago BM. International classification of diseases - 11th revision: from design to implementation. Rev Saude Publica. 2020;54:104. doi: 10.11606/s1518-8787.2020054002120.
2. Lindenberg K, Kindt S, Szász-Janocha C. Effectiveness of cognitive behavioral therapy-based intervention in preventing gaming disorder and unspecified internet use disorder in adolescents: a cluster randomized clinical trial. JAMA Netw Open. 2022;5(2):e2148995. doi: 10.1001/jamanetworkopen.2021.48995 .

3. Horita H, Seki Y, Yamaguchi T, Shiko Y, Kawasaki Y, Shimizu E. Videoconference-delivered cognitive behavioral therapy for parents of adolescents with internet addiction: pilot randomized controlled trial. JMIR Pediatr Parent. 2024;7:e60604. doi: 10.2196/60604.
4. Ding K, Li H. Digital addiction intervention for children and adolescents: a scoping review. Int J Environ Res Public Health. 2023;20(6):4777. doi: 10.3390/ijerph20064777.
5. Wang H, Li X, Lok GK, Meng C, Tan Y, Lee UM, et al. Family-based therapy for internet addiction among adolescents and young adults: a meta-analysis. J Behav Addict. 2024;13(2):295-312. doi: 10.1556/2006.2024.00015.
6. Reuman L, Thompson-Hollands J, Abramowitz JS. Better together: a review and recommendations to optimize research on family involvement in CBT for anxiety and related disorders. Behav Ther. 2021;52(3):594-606. doi: 10.1016/j.beth.2020.07.008.
7. Agbaria Q. Cognitive behavioral intervention in dealing with internet addiction among Arab teenagers in Israel. Int J Ment Health Addict. 2022:1-15. doi: 10.1007/s11469-021-00733-6.
8. Babakhanian M, Khalvati M, Karbasi A, Sohrabnejad S, Shaabani N, Mahdavy F, et al. The Effect of Cognitive-Behavioral Therapy on Reducing Symptoms and Negative Consequences of Internet Addiction in Adolescents: A Systematic Review. Available from: https://osf.io/vw9nj/?view_only=26f293c748c74ee0b965dcafa78931c2.
9. qual, BMJ Open. PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only. .BMJ Open Qual 2023; 12:e002310. doi: 10.1136/bmjoq-2023-002310
10. Boutron I, Altman DG, Moher D, Schulz KF, Ravaud P. CONSORT statement for randomized trials of nonpharmacologic treatments: a 2017 update and a CONSORT extension for nonpharmacologic trial abstracts. Ann Intern Med. 2017;167(1):40-7. doi: 10.7326/m17-0046.
11. Sterne JA, Egger M. Regression methods to detect publication and other bias in meta-analysis. In: Rothstein HR, Sutton AJ, Borenstein M, eds. Publication Bias in Meta-Analysis: Prevention, Assessment and Adjustments. 2005. p. 99-110. doi: 10.1002/0470870168.ch6.
12. Duval S, Tweedie R. Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. Biometrics. 2000;56(2):455-63. doi: 10.1111/j.0006-341x.2000.00455.x.
13. Cohen J. Statistical Power Analysis for the Behavioral Sciences. New York: Academic Press; 1988. p. 54.
14. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. BMJ. 2003;327(7414):557-60. doi: 10.1136/bmj.327.7414.557.
15. Szász-Janocha C, Vonderlin E, Lindenberg K. Treatment outcomes of a CBT-based group intervention for adolescents with internet use disorders. J Behav Addict. 2020;9(4):978-89. doi: 10.1556/2006.2020.00089.
16. Liu QX, Fang XY, Yan N, Zhou ZK, Yuan XJ, Lan J, et al. Multi-family group therapy for adolescent internet addiction: exploring the underlying mechanisms. Addict Behav. 2015;42:1-8. doi: 10.1016/j.addbeh.2014.10.021.
17. Du YS, Jiang W, Vance A. Longer term effect of randomized, controlled group cognitive behavioural therapy for internet addiction in adolescent students in Shanghai. Aust N Z J Psychiatry. 2010;44(2):129-34. doi: 10.3109/00048670903282725 .
18. Jasuma NH, Sugiyo S, Mulawarman M. The effectiveness of cognitive behavior therapy group counseling with assertive training and cognitive restructuring techniques to reduce social media addiction. Jurnal Bimbingan Konseling. 2023;12(1):52-9.
19. Lindenberg K, Kindt S, Szász-Janocha C. Effectiveness of cognitive behavioral therapy-based intervention in preventing gaming disorder and unspecified internet use disorder in adolescents: a cluster randomized clinical trial. JAMA Netw Open. 2022;5(2):e2148995. doi: 10.1001/jamanetworkopen.2021.48995.
20. Ahmadi S, Ilanloo H, Zahrakar K. The effectiveness of cognitive-based mindfulness group counseling on internet addiction and academic procrastination in secondary high school students. Journal of Modern Psychological Researches. 2022;17(66):13-24. doi: 10.22034/jmpr.2022.15289. [Persian].
21. Pourrosta A, Hamid N, Beshlideh K, Hashemi SE. Comparing the effectiveness of therapy based on positive psychology and cognitive-behavioral therapy on internet addiction and high-risk behaviors students. Journal of Modern Psychological Researches. 2024;19(73):22-34. doi: 10.22034/jmpr.2023.54827.5379. [Persian].
22. Kafnia F, Farhadi H. Effectiveness of group cognitive-behavioral therapy on communicative skills and internet addiction of second grade high school students. Journal of Analytical Cognitive Psychology. 2019;10(39):87-98. [Persian].
23. Du YS, Jiang W, Vance A. Longer term effect of randomized, controlled group cognitive behavioural therapy for internet addiction in adolescent students in Shanghai. Aust N Z J Psychiatry. 2010;44(2):129-34. doi: 10.3109/00048670903282725.
24. Shi L, Lin L. The trim-and-fill method for publication bias: practical guidelines and recommendations based on a large database of meta-analyses. Medicine (Baltimore). 2019;98(23):e15987. doi: 10.1097/md.0000000000015987.
25. Zhang X, Zhang J, Zhang K, Ren J, Lu X, Wang T, et al. Effects of different interventions on internet addiction: a meta-analysis of random controlled trials. J Affect Disord. 2022;313:56-71. doi: 10.1016/j.jad.2022.06.013 .
26. Young KS. CBT-IA: the first treatment model for internet addiction. J Cogn Psychother. 2011;25(4):304-12. doi: 10.1891/0889-8391.25.4.304.
27. Zhang X, Zhang J, Zhang K, Ren J, Lu X, Wang T, et al. Effects of different interventions on internet addiction: a meta-analysis of random controlled trials. J Affect Disord. 2022;313:56-71. doi: 10.1016/j.jad.2022.06.013.
28. King DL, Delfabbro PH, Griffiths MD, Gradisar M. Cognitive-behavioral approaches to outpatient treatment of internet addiction in children and adolescents. J Clin Psychol. 2012;68(11):1185-95. doi: 10.1002/jclp.21918.
29. Malinauskas R, Malinauskiene V. A meta-analysis of psychological interventions for internet/smartphone addiction among adolescents. J Behav Addict. 2019;8(4):613-24. doi: 10.1556/2006.8.2019.72.
30. Chen L, Nath R. Understanding the underlying factors of internet addiction across cultures: a comparison study. Electron Commer Res Appl. 2016;17:38-48. doi: 10.1016/j.elerap.2016.02.003.
31. Sterne JA, Egger M, Smith GD. Systematic reviews in health care: Investigating and dealing with publication and other biases in meta-analysis. BMJ. 2001;323(7304):101-5. doi: 10.1136/bmj.323.7304.101.
32. Thompson SG, Higgins JP. How should meta-regression analyses be undertaken and interpreted? Stat Med. 2002;21(11):1559-73. doi: 10.1002/sim.1187.
33. Kuss DJ, Lopez-Fernandez O. Internet addiction and problematic internet use: a systematic review of clinical research. World J Psychiatry. 2016;6(1):143-76. doi: 10.5498/wjp.v6.i1.143.
34. Parry SW, Bamford C, Deary V, Finch TL, Gray J, MacDonald C, et al. Cognitive-behavioural therapy-based intervention to reduce fear of falling in older people: therapy development