

The Impact of Chatbots on Adolescent Mental Health Development: A Comprehensive Literature Review

Yidong Wu^{1,*}, Tong Wu^{2,*}, Kerun Zhu³, Xinyu Liu³, Jiarui Liu³, Yuyan Wang³, Ruojin Shi³, Jia Xiong³, Xinyue Xing³, Yao Lv³, Yaohong Niu³, Min Peng⁴, Xingyan Du¹

¹School of Journalism and Communication, Lanzhou University, Lanzhou, 730000, People's Republic of China; ²School of International Culture and Communication, Communication University of Zhejiang, Hangzhou, 310018, People's Republic of China; ³School of Journalism and New Media, Xi'an Jiaotong University, Xi'an, Shaanxi, 710049, People's Republic of China; ⁴Health Science Center, Xi'an Jiaotong University, Xi'an, Shaanxi, 710049, People's Republic of China

*These authors contributed equally to this work

Correspondence: Min Peng, Health Science Center, Xi'an Jiaotong University, No. 28 Xianning West Road, Beilin District, Xi'an, Shaanxi, 710049, People's Republic of China, Tel +86 029-82655011, Email pengmin2020@stu.xjtu.edu.cn; Xingyan Du, School of Journalism and Communication, Lanzhou University, No. 222, Tianshui South Road, Chengguan District, Lanzhou, Gansu, 730000, People's Republic of China, Tel +86 0931 – 8915625, Email dxy@lzu.edu.cn

Abstract: The integration of artificial intelligence (AI) chatbots in adolescent mental health care represents a transformative shift in how digital interventions address psychological well-being among young populations. This comprehensive review synthesizes evidence examining the multifaceted impact of chatbot technology on adolescent mental health development. A systematic search was conducted across PubMed, PsycINFO, Web of Science, and Scopus databases using terms related to chatbots, conversational agents, adolescents, and mental health. Following PRISMA guidelines, 80 studies published between 2020 and 2025 were included after screening 1247 initial records and excluding duplicates and irrelevant articles. Through systematic analysis, we explore the complex relationships between chatbot usage and emotional health, social development, cognitive functioning, and behavioral patterns among adolescents aged 10–24 years. The review reveals that chatbots demonstrate moderate effectiveness in reducing psychological distress ($g = -0.46$ to -0.10) and show promise in addressing barriers to mental health care access, particularly stigma-related concerns. However, emerging evidence also highlights potential risks including dependency, social withdrawal, and privacy concerns. The findings suggest that while chatbots offer valuable supplementary mental health support, careful consideration of ethical implications, cultural adaptations, and long-term developmental effects is essential for responsible implementation.

Keywords: chatbot, adolescents, mental health, artificial intelligence

Introduction

The global population of young people aged 10–24 years reached approximately 1.95 billion in 2024, with 62.5% of mental disorders emerging during this critical developmental period.¹ This demographic faces an unprecedented intersection of technological advancement and mental health challenges. Reports indicate that 72% of teens have used AI companions, and 33% have developed relationships with these chatbots.²

The evolution of chatbot technology from simple rule-based systems to sophisticated large language models has fundamentally altered the landscape of mental health support for adolescents. These AI chatbots are trained on extensive text data, enabling them to understand context and nuances, making interactions more human-like.³ This technological sophistication arrives at a critical juncture, as traditional mental health services face severe accessibility challenges, with waiting times for child psychiatric consultation extending from 3 months to a year in some regions.^{4,5}

Despite the proliferation of chatbot technology in adolescent mental health services, significant gaps remain in our understanding of their comprehensive developmental impacts. Current literature lacks synthesis of evidence across emotional, social, cognitive, and behavioral domains, and the balance between therapeutic benefits and potential risks remains inadequately characterized. This review addresses the following research questions: (1) What is the effectiveness of chatbots in reducing mental health symptoms among adolescents? (2) How do chatbots influence adolescent social development and relationship formation? (3) What are the cognitive and behavioral implications of chatbot use during this developmental period? (4) What factors moderate chatbot effectiveness across diverse adolescent populations?

Overview of Chatbot and Adolescent Interaction

Evolution of Chatbot Technology in Mental Health

The journey of mental health chatbots began with ELIZA in 1966, a program developed by Joseph Weizenbaum at MIT that simulated a Rogerian psychotherapist through pattern-matching techniques.⁶ The field has since evolved through rule-based systems to today's sophisticated AI-powered conversational agents. Current systems powered by large language models exhibit remarkable capabilities due to extensive training datasets and advancements in natural language processing.^{7,8}

Classification and Applications of Mental Health Chatbots

Mental health chatbots serve diverse functions across the care continuum, including screening, preventive psychoeducation, and therapy.^{1,9} Based on functional scope, chatbots can be categorized into screening and assessment chatbots, psychoeducational chatbots, and therapeutic chatbots delivering structured treatment protocols.

Regarding therapeutic frameworks, Cognitive Behavioral Therapy (CBT) chatbots represent the most prevalent type, with 7 out of the 26 theory-based studies in our review utilizing the CBT approach.⁹ This dominance reflects CBT's established efficacy and structured nature, which translates effectively to digital formats. Acceptance and Commitment Therapy (ACT) chatbots have also emerged, showing promise in addressing psychological flexibility.^{10,11}

The commercial landscape features several prominent platforms. Woebot represents a clinically-validated therapeutic chatbot demonstrating effectiveness in reducing depression and anxiety symptoms.¹² Wysa exemplifies a hybrid model combining AI-driven psychoeducation with optional human coaching.¹³ Replika, with over six million users globally, provides emotional connection and social interaction.¹⁴ Character.AI has gained traction among teenagers, though it has faced scrutiny regarding safety concerns with minor users.¹⁵

Current Usage Patterns Among Adolescents

Research indicates that 49.3% of 12- to 17-year-olds use voice assistants embedded in digital media, with 55% engaging with chatbots more than once daily.^{16,17} Notably, 19% of teens who use AI companions spend equal or more time with them than with real friends.¹⁸

A study of Danish high school students demonstrates the global nature of this phenomenon, with 14.6% engaging in friend-like conversations with chatbots. Among these users, 81.7% engaged in utilitarian conversations while 18.3% engaged in social-supportive conversations.¹⁹ Those using chatbots for social support reported significantly more loneliness than non-users ($d=0.53$) and less perceived social support ($d=-0.46$).¹⁹

Impact of Chatbots on Adolescent Emotional Health

Effectiveness in Symptom Reduction

Meta-analytic evidence demonstrates that chatbot-delivered interventions produce small-to-moderate effects in reducing psychological distress among young people ($g = -0.46$ to -0.10).^{1,8,20} This effect size, while lower than some adult populations, remains clinically significant. Systematic reviews have found that conversational agent interventions show consistent positive effects across multiple mental health outcomes.²¹

In a pilot study of CBT delivered via chatbot to adolescents with moderate depression, mean PHQ-9 scores decreased by 3.3 points in the treatment group, representing a shift from moderate to mild symptom severity ($p < 0.05$).²²⁻²⁴ The

Polish-language Fido chatbot achieved similar results, with participants showing significantly greater reduction in anxiety ($p < 0.01$) and depressive symptoms ($p < 0.05$) compared to control groups.²⁵

Mechanisms of Emotional Support

The therapeutic mechanisms underlying chatbot effectiveness involve multiple pathways. Analysis of conversation data reveals that chatbots provide a sense of anonymity and confidentiality, fostering trust among individuals hesitant to seek in-person help.²⁶ This anonymization effect is particularly powerful for adolescents facing developmental challenges around identity formation. Chatbots facilitate emotional processing through immediate validation without judgment and consistent availability during crisis moments, offering support whenever needed due to 24/7 availability.^{13,27}

Cultural and Contextual Variations

The effectiveness of emotional support varies significantly across cultural contexts. Research examining Western and Eastern countries revealed distinct patterns in how adolescents express depressive moods through chatbot interactions.²⁶ Western adolescents tend to exhibit more direct expressions of emotional distress, preferring solution-focused strategies. In contrast, Eastern adolescents often express emotional concerns more implicitly and value responses emphasizing social harmony and family relationships. Indian adolescents valued privacy and emotional support but found existing chatbots lacking in personalization and cultural relevance.²⁸

Impact of Chatbots on Adolescent Social Development

The Paradox of Social Connection

Chatbots present a fundamental paradox in adolescent social development. While they offer companionship and reduce loneliness in the short term, research reveals concerning patterns of social substitution. Danish high school students using chatbots for social-supportive conversations reported significantly higher loneliness than both non-users and utilitarian users.¹⁹ This finding suggests that chatbot relationships may serve as markers of existing social difficulties rather than solutions.

Research indicates that while users understand chatbot friendships in similar ways to human friendships, the artificial nature alters the notion of friendship, allowing for more personalized interactions tailored to user needs.¹⁴ This customization, while initially appealing, may impede development of crucial social skills needed for navigating complex human relationships.

Impact on Social Skill Development

Research on social skill development reveals mixed outcomes. For adolescents with autism spectrum disorder and social anxiety, chatbots may provide valuable practice opportunities, as these individuals are more likely to become involved in online chatting due to difficulties reading social cues in face-to-face interactions.²⁹ However, experts warn that chatbot interactions may be counterproductive to social skill development when they allow users to control conversations, interrupt responses, and avoid social consequences.²⁹

Real friendships teach irreplaceable lessons through navigating friends' varying moods and personalities.² These nuanced social experiences cannot be replicated in chatbot interactions, potentially leaving adolescents ill-equipped for real-world social challenges.

The Role in Peer Support and Bullying Contexts

Chatbots show promise in addressing peer-related challenges. Research indicates that children and teenagers prefer chatbots for discussing sensitive subjects because they feel less judged and without verbal or non-verbal reactions.³⁰ However, chatbots remain inaccurate regarding emotion detection, and their language is not adapted to children's communication styles, and they are too predictable,³⁰ raising concerns about effectiveness in peer conflict situations.

Impact of Chatbots on Adolescent Cognitive Development

Effects on Learning and Academic Performance

Meta-analyses demonstrate that chatbot-based learning was more effective than traditional learning in terms of explicit reasoning, learning achievement, knowledge retention, and learning interest.²¹ Students using ChatGPT showed improvements in knowing, applying, and reasoning subskills.^{7,31}

However, concerns exist about long-term cognitive impacts. Relying excessively on AI chatbots as replacements for executive functions may diminish the very cognitive abilities they substitute.³¹ This concern is particularly acute during adolescence, identified as a crucial stage for executive function development.³¹

Impact on Critical Thinking and Problem-Solving

Research on critical thinking reveals a nuanced picture. While some studies suggest that ChatGPT interaction can promote complex critical thinking skills through immediate feedback and personalized guidance,³² others highlight concerning patterns where students accept inaccurate answers and use copy-and-paste without critically evaluating information.³²

The concept of AI chatbot-induced cognitive atrophy has emerged as a significant concern. Overreliance on AI chatbots may lead to broader cognitive decline, particularly affecting individuals who have not attained mastery in their fields of study, including children and adolescents.³ This aligns with the neuroscience principle suggesting that neural circuits may degrade if not actively engaged.

Development of Mental Health Literacy

Chatbots demonstrate significant potential in enhancing mental health literacy among adolescents. Studies show that chatbots can effectively deliver psychoeducation about depression, teach behavioral activation techniques, and help adolescents identify negative thought patterns.^{33–35} Randomized controlled trials found that topic-based chatbots significantly improved self-care efficacy and mental health literacy immediately after intervention and at one-month follow-up.³⁶

Impact of Chatbots on Adolescent Behavioral Patterns

Transformation of Help-Seeking Behaviors

Chatbots fundamentally alter traditional help-seeking patterns among adolescents. Young people show greater inclination toward online resources due to increased privacy, reduced stigma, and enhanced autonomy.⁵ By providing anonymity, chatbots effectively address concerns related to discussing sensitive topics and combat stigma associated with seeking help.^{8,37}

Research on self-stigma found that high help-seeking self-stigma associated with human-delivered psychotherapy was linked to more negative attitudes towards human therapy but more positive attitudes towards AI-delivered psychotherapy.^{38,39} This suggests chatbots may serve as crucial entry points for adolescents who would otherwise avoid mental health services.

Daily Engagement and Usage Patterns

Research identifies six primary symptoms characterizing problematic AI chatbot use: compulsive checking, withdrawal symptoms, neglecting responsibilities, continued use despite negative consequences, loss of control over usage time, and prioritizing chatbot interactions over human relationships.¹⁵

Longitudinal research with middle and high school students aged 12–18 years demonstrated that mental health problems at baseline predicted AI dependence at 6-month follow-up through mediating pathways involving attachment and emotional regulation motivations.^{16,40} Adolescents with mental health problems show particularly high risk for developing dependency patterns.

Impact on Daily Routines and Health Behaviors

The #LIFEGOALS intervention, which included an AI chatbot component, showed positive effects on physical activity, sleep quality, and positive moods among adolescents.³⁷ However, the pandemic context moderated these effects, with in-

person schooling enhancing mental health benefits, suggesting chatbot interventions work best as supplements rather than replacements for real-world structures.

Similar to broader problematic technology use, AI chatbot dependency is associated with sleep problems, poor task performance, physical pain, and disruption of real-life relationships.^{16,41}

Differential Impact Across Adolescent Populations

Age-Related Differences

Developmental stage significantly moderates chatbot effectiveness. Meta-analyses reveal that chatbots had a greater effect on students in higher education compared to those in primary and secondary education.⁴² Younger adolescents (11–13 years) demonstrate different interaction patterns than older teens (15–18 years), with constant online contact peaking among 15-year-old girls (44%).⁴³

Gender Differences

Gender emerges as a crucial moderating variable. Girls report higher levels of problematic social media use (13% vs 9% for boys) and may transfer these patterns to chatbot interactions.^{43,44} Conversely, boys show higher rates of problematic gaming (16% vs 7%).⁴³ Female adolescents comprised 88% of participants in CBT chatbot trials, potentially indicating greater openness to digital mental health interventions but raising questions about generalizability.^{22,23}

Variations by Mental Health Status

Pre-existing mental health conditions profoundly influence chatbot interaction outcomes. Adolescents with social anxiety show paradoxical patterns: while chatbots offer safe means of rehearsing social interaction, excessive use correlates with increased loneliness and depression.²⁹ Clinical severity also determines appropriateness, with primary care providers recommending against chatbot use for teens with active suicidality or self-harm.^{23,24}

Cultural and Socioeconomic Factors

Cultural context profoundly shapes chatbot effectiveness. Adolescents from higher socioeconomic backgrounds typically have better access to devices, while language barriers disproportionately affect non-English speaking populations. These multifaceted barriers create risk that chatbot interventions may inadvertently widen existing health disparities.⁴⁵

Opportunities and Challenges

Technological Opportunities

Advances in natural language processing enable chatbots to provide increasingly sophisticated therapeutic interactions. Real-time emotion recognition, personalized intervention adaptation, and integration with wearable devices represent emerging frontiers.⁴⁶ The scalability of chatbot interventions addresses critical access gaps in underserved communities.⁴

Ethical Challenges

Privacy and data security concerns rank paramount, particularly given adolescents' developmental vulnerability.^{47–49} While 46% of studies addressed safety features, only 31% included reminders that users were interacting with chatbots rather than human experts.⁵⁰ The risk of therapeutic misconception is particularly concerning for adolescents.

Regulatory Frameworks

No AI chatbot has received FDA approval to diagnose, treat, or cure a mental health disorder.⁵¹ This regulatory gap creates risks of unchecked spread of potentially harmful chatbots.⁵¹ The American Psychological Association urges implementation of safeguards against AI chatbots posing as therapists.^{51,52}

Critical Analysis of Research Status

The current evidence base demonstrates both progress and significant limitations. Most studies employ small sample sizes with fewer than 100 participants.^{22,23} Study durations typically span 2–12 weeks with limited long-term follow-up.^{25,53} Short interventions showed stronger effects on learning outcomes than long interventions, potentially due to novelty effects.⁴²

Critical research gaps include long-term developmental impacts, differential effectiveness across diverse contexts, optimal integration models combining chatbot and human support, mechanisms underlying therapeutic change, and prevention of dependency patterns.

Implications for Practice and Future Prospects

Clinical Integration Strategies

Primary care providers suggest introducing chatbot interventions at diagnosis when motivation for change is high.^{23,24} The stepped-care model positions chatbots as first-line interventions for mild-to-moderate symptoms, with clear escalation pathways to human providers for severe cases. Hybrid models combining chatbot and human support show particular promise, with chatbots potentially serving as mediators building trust that transfers to human professionals.^{54,55}

Design Recommendations

Evidence-based design principles include developmental appropriateness with age-appropriate language,^{33,56} cultural sensitivity incorporating local values and linguistic variations,^{26,28,45} mandatory safety features including crisis detection and automatic escalation,^{50,52} therapeutic integrity grounded in evidence-based frameworks,^{9,11} and privacy by design with robust data protection.^{47,48,57}

Educational and Policy Recommendations

Comprehensive digital literacy education must accompany chatbot deployment. Adolescents need skills to critically evaluate AI-generated responses, understand chatbot limitations, and recognize signs of problematic use.⁵⁸ Parents and educators require parallel guidance on supporting healthy chatbot use.

Policy development must address the current regulatory vacuum through mandatory safety standards for chatbots marketed to minors, requirements for clinical validation before mental health claims, age-appropriate design guidelines, and data protection standards specific to adolescent mental health information.

Research Priorities

Future research must address critical knowledge gaps through rigorous longitudinal designs. Priority areas include understanding developmental trajectories across adolescence into young adulthood, precision matching to identify which adolescents benefit most, optimal integration models comparing standalone versus integrated interventions, and prevention potential examining whether chatbots can prevent mental health problem onset in at-risk populations.

Conclusion

This comprehensive review of 80 studies reveals that AI chatbots can provide meaningful mental health benefits for adolescents, particularly in reducing symptoms of depression and anxiety, improving mental health literacy, and overcoming help-seeking barriers. The moderate effect sizes observed ($g = -0.46$ to -0.10) represent clinically significant improvements for a population facing substantial barriers to traditional mental health services.

The analysis also reveals concerning patterns including problematic use, potential for cognitive dependency, and risks to social development. Social-supportive chatbot users reporting higher loneliness than non-users suggests chatbots may serve as markers of distress rather than solutions.

The optimal approach involves positioning chatbots as supplements rather than replacements for human connection and professional care. Hybrid models combining technological accessibility with human oversight show greatest promise.

Cultural and contextual sensitivity emerges as paramount, with one-size-fits-all approaches failing to serve diverse populations.

The evidence supports careful implementation of chatbot interventions within stepped-care frameworks, with attention to individual characteristics including age, gender, mental health status, and cultural background. Future research should prioritize longitudinal designs examining developmental trajectories, precision approaches to matching adolescents with appropriate interventions, and investigation of prevention potential. Regulatory frameworks must evolve to ensure safety while preserving access benefits.

Disclosure

The authors report no conflicts of interest in this work.

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