

Evaluating Mobile Health Interventions for Student Mental Health

Chenglin Zhang *

Specialist (Co-operative) Program in Mental Health Studies, University of Toronto, Toronto, Canada

* Corresponding Author Email: luckylynn.zhang@mail.utoronto.ca

Abstract. As a group in the transition period of psychological development, college students face multiple pressures such as academics, interpersonal relationships and adaption, and the incidence of common psychological problems such as anxiety and depression is high. In recent years, the mobile health (mHealth) tool has gradually been regarded as a powerful supplement to campus psychological services because of its convenience, anonymity and low cost. This paper systematically evaluates the effectiveness of mHealth tools in college students' anxiety and depression interventions, the differences between different types of intervention (cognitive behavior therapy, mindfulness meditation, conversational agent), and the influencing mechanism behind user experience and compliance. The study shows that mHealth tools have small to medium intervention effects, but different tools vary significantly in usability and user stickiness; students are more inclined to use interface-friendly, interactive and personalized applications. Based on the existing evidence, this paper points out that the mHealth tool should not be regarded as a substitute for traditional counseling, but as an auxiliary tool in the campus mental health system. The paper conclusions can provide theoretical support and practical reference for the digital design and integration of psychological services in college and universities in the future.

Keywords: Mobile Health (mHealth); mental health of college students; anxiety and depression intervention; digital psychological intervention.

1. Introduction

College students are in a critical transitional period of psychological development, facing multiple challenges such as academic pressure, interpersonal adaptation, and career planning, making them a high-risk group for common mental disorders including anxiety and depression. A systematic review of research in this field reveals that existing studies have confirmed the high prevalence of mental disorders among college students, but there remains a gap in the integrated analysis of mobile health (mHealth) intervention tools—most studies focus on verifying the effectiveness of a single tool, lacking horizontal comparisons between different tools and systematic extraction of key factors influencing intervention effects. Based on this, this review focuses on the core scenario of "anxiety and depression intervention among college students" and systematically organizes three dimensions: effectiveness of mHealth tools, differences between tool types, and influencing factors. It clarifies the applicable scenarios and optimization directions of different tools, providing theoretical support for the digital upgrading of campus mental health service systems.

A large number of studies have shown that college students are a high risk of common psychological disorders, such as anxiety and depression. According to a multi-country survey based on the World Health Organization's project, about one-third of college students have met at least one common screening criterion for mental disorders, and anxiety and depression are one of the most common problems [1]. The systematic review of the depression of college students also points out that the prevalence of depressive symptoms in this population is significantly higher than that in the general population, and consistent high burden characteristics in different countries and cultural contexts [2]. Against this background, mobile health (mHealth) intervention, which has the characteristics of low threshold, anonymous use and easy scale, is gradually regarded as an important supplement to traditional campus psychological services, and has attracted continuous research attention in the field of anxiety and depression intervention for college students.

2. Effectiveness of mHealth Tools for Treating Anxiety and Depression in University Students

2.1. Application effects based on Cognitive Behavioral Therapy (CBT)

Multiple studies have demonstrated that mobile applications based on CBT can help reduce anxiety and depressive symptoms in college students. For example, in a randomized controlled trial of college students with depression and anxiety symptoms, the fully automated CBT chat robot Woebot significantly reduced the Patient Health Questionnaire-9 (PHQ-9) scores within 2 weeks, with a more significant reduction in depressive symptoms compared to the control group [3]. In this study, the Woebot Group used it about 12 times on average, and the symptoms of depression improved significantly, while the control group did not have this effect.

Similarly, a randomized trial for the Maya self-help CBT application showed that there was no difference in the effectiveness of different stimulation strategies between groups, but overall, the anxiety symptoms were greatly reduced after the use of the CBT application, with a significant clinical improvement [4]. These results support the effectiveness of self-guided mobile CBT applications in reducing anxiety and depression symptoms in young adults.

2.2. Application Effects based on Mindfulness Meditation Applications

Studies also support the positive impact of mindfulness meditation mobile applications on psychological symptoms. The application, such as Headspace, has been verified to a certain extent in college students and young people: a systematic review found that 75% of the RCTs evaluating Headspace reported that it could significantly reduce depressive symptoms [5]. More than 40% of studies observed the improvement of anxiety, stress and other indicators.

Another randomized controlled trial, whose subjects are college students who have psychological distress during COVID-19, designed a mobile intervention program based on the concept of mindfulness [6]. The results showed that compared with the control group, the students in the intervention group had a significant decrease in depression, anxiety and stress levels, and the level of mindfulness and psychological flexibility was improved. Overall evidence shows that the application of mindfulness can help relieve the stress, anxiety and other psychological troubles of college students.

2.3. Application Effects based on Conversational Agent (Chat Robot)

A conversation agent provides psychological support through simulated dialogue, which shows good feasibility and initial therapeutic effect among college students [3]. In addition to Woebot, another study of the chatbot Tess also provided evidence: in an RCT for college students, after 2 to 4 weeks of using the Tess chatbot, the PHQ-9 depression score and GAD-7 anxiety score of the intervention group were significantly lower than the baseline [7]. It shows that this kind of AI chat tool has good acceptance and continuous participation in the short term. In general, chatbots combined with CBT skills have been proven to effectively decrease the depression and anxiety symptoms of college students.

3. Comparative Analysis of mHealth Intervention Types

3.1. Efficacy Comparison

The aforementioned studies have confirmed the effectiveness of various mHealth tools. However, differences exist in their application scenarios and user experience. A further comparison of their core characteristics is necessary to clarify applicable scenarios and provide a basis for tool selection. Current evidence shows that there is little difference in the short-term efficacy of various mHealth tools (such as CBT applications, mindfulness meditation applications, chatbots, etc.) A large-scale randomized trial compared three digital interventions (CBT-based SilverCloud application, mindfulness-based Headspace application, and personalized feedback EPF system) [8]. After 6 weeks,

students depressed (PHQ-9) and anxious (GAD-7) scores had improved significantly in all intervention groups, and there was no statistical difference between the improvement of each group. For example, the average decrease in depressive symptoms in the CBT application group and the mindfulness application group was similar, suggesting that different types of self-help applications in college students can produce moderate symptom relief. The only subtle difference is that the mindfulness application group is slightly better than the CBT group in improving suicidal thoughts, but in general, the effectiveness of various digital interventions is comparable.

3.2. Differences in Usability and User Experience

3.2.1 CBT applications

These kinds of applications usually require users to perform homework tasks such as emotional recording and completing cognitive exercises. For students who are in psychological distress, this kind of self-monitoring and exercise may feel heavy and difficult to stick to for a long time. The analysis of thousands of user reviews also found that if the application requires users to invest a lot of time and energy but lacks immediate support or feedback, users tend to feel frustrated and give up using it [9]. In other words, too serious functional design may make the application experience more like completing tasks instead of getting help, which weakens users' stickiness.

3.2.2 Mindfulness meditation application

The interaction of mindfulness meditation applications is relatively simple, and users only need to follow the audio guidance to practice meditation for a few minutes every day. Because it is easy to operate and can bring an instant relaxation effect, this kind of application is more friendly to beginners, and it is easier for users to get started and integrate it into their daily lives.

Its wide appeal is also reflected in the size of users: a review found that although only about 37% of mental health applications on the market include mindfulness training, meditation applications (such as Headspace and Calm) contribute up to 96% of the monthly active users of all mental health applications [10]. However, it also faces the problem of low long-term adhesion, as only about 4.7% of new users still use the meditation application after downloading it for 30 days [10]. Although this retention rate seems to be very low, continuous participation in meditation applications is still better than that of many other types of mental health applications. This means that mindfulness meditation has an advantage in initially attracting users with its simplicity.

3.2.3 Chatbot application

Therapeutic chatbots provide support to users through dialogue. Its interface is more interactive and interesting, and users can communicate with it at any time, like chatting with real people. This conversational interface takes advantage of the characteristics that humans tend to regard computer agents as social objects. In a randomized controlled experiment for college students, the improvement in depression symptoms of the group that received chatbot psychological intervention was equivalent to that of the group that received text self-help, but the treatment alliance score of the former was significantly higher, and user feedback also clearly indicated the interaction process factors (e.g., the interactivity of robot dialogue, tone style, etc.) has a greater impact on satisfaction than the intervention content itself [11]. This shows that compared with plain text or video courses, chatbot dialogue interaction can improve the acceptability of the intervention.

In general, different types of mobile interventions have their own advantages and disadvantages: CBT applications provide structured training but may be boring. Mindfulness applications are simple and easy to do, but some students may find it difficult to stick to them alone. Chatbot interactions are interesting, but inappropriate responses to serious problems should be avoided. Understanding these differences helps to select or combine the most appropriate digital psychological interventions for college students.

4. Factors Influencing Effectiveness and Adoption of mHealth Interventions

Differences in the characteristics of the tools themselves are the superficial causes of differences in efficacy and user experience, which are further influenced by multiple factors such as user attributes and cultural contexts. Based on research evidence, these influencing factors can be categorized into user-level factors and tool-level factors. The key influencing factors are systematically elaborated below.

4.1. Stigma and Confidentiality Considerations

In terms of ease of use, mobile applications have significant advantages, as they can be used anytime and anywhere, anonymously and at low cost, which is in line with the living habits of college students. Students often report that they like the privacy and immediacy of these tools, and there is no need to wait in line for consultation [12]. The mobile health application provides a relatively private and self-service environment, so that students do not need to disclose their troubles. This destigmatizing advantage is regarded as a key factor in improving the accessibility of intervention. Therefore, if schools promote such tools, they should emphasize their confidentiality and anonymity to reduce students' concerns.

4.2. Need for Interpersonal Support and Hybrid Counseling

Although the mHealth tool emphasizes self-help, most students are reluctant to use mobile phone applications as the only source of psychological support. According to the survey, when asked whether they would prefer to use the App rather than seek professionals if they encounter psychological problems, only about 9% of students said yes, and more than 86% of students were either not sure about the effectiveness of the application or clearly believed that the application could not replace professional help [12]. This shows that applications are more regarded as a supplement to professional services than a substitute.

More than half of the respondents mentioned in the qualitative feedback that they hoped that manual interaction could be integrated into the application, no matter whether it is chatbots that simulate stronger humanity or real-life counselors answering questions online [13]. This demand shows that completely isolated self-help applications may not fully satisfy all students, and a hybrid mode (digital tools plus human support) may be more ideal. Some studies have found that the use rate and effectiveness of guided digital interventions (such as weekly coach follow-up) are higher than those of pure self-help [3].

4.3. Cultural Adaptability and Content Sensitivity

The group of college students is increasingly diverse, and students from different cultures and backgrounds may have different understandings and acceptances of mental health. If the content of the intervention does not take into account cultural differences, the effect may be reduced. For example, international students or ethnic minority students may feel that language expressions, physiological exercises or cases in certain applications do not meet their cultural context, thus reducing their participation.

Researchers emphasize that digital intervention requires cultural and situational adaptation, including language translation, localization cases, metaphors in line with specific cultural values, etc. [14]. A narrative review of digital health interventions points out that a combination of cultural background and socio-economic factors for adaptation can improve the accessibility and sustainability of interventions [14]. For example, when designing a stress management app for Asian students, it may be more acceptable to integrate into family and academic-related situations and avoid direct mental illness labels. Therefore, cultural fit is a hidden factor affecting the success or failure of mHealth interventions. When promoting these tools, colleges and universities should try to provide multilingual and multicultural versions or options to match the characteristics of student groups.

4.4. Personalization and Adaptability

The degree of personalization is an important psychological factor affecting the effect of the intervention. If the app can provide customized content according to the user's symptom level, preferences and cultural background, students tend to feel more relevant and helpful. The developer has put forward a number of digital intervention design guidelines, such as automatic content adjustment and real-time feedback for user emotions, to improve the therapeutic effect [3].

Student feedback also emphasized the important impact of the reliability and design of the application on their acceptance. 24% of users said that some applications did not really improve mental health, perhaps because of the lack of content quality or adaptability [12]. Therefore, in terms of technical implementation, personalized solutions through machine learning or user input, and providing diversified modules to meet different needs, are expected to improve the acceptance and intervention effect of college students.

5. Conclusion

This study focuses on the effectiveness and usability of mHealth tools in college students' anxiety and depression interventions, and systematically sorts out and compares the tool types, use experiences and intervention mechanisms. Based on empirical research results, this paper finds that all kinds of mHealth tools can bring small to moderate emotional improvement effects in the short term, with initial psychological intervention value; but in terms of usability, user stickiness and field, there are significant differences in the performance of adaption. In contrast, although structured CBT tools are systematic, they are difficult in use. Mindfulness tools are simple and easy to get started, but have a low retention rate. Conversational tools are more user-acceptable because of their strong interactivity and timely feedback. Further analysis shows that the key mechanisms that affect the effectiveness of mHealth tools include not only the intervention content itself, but also multiple factors such as the privacy trust, interpersonal support structure, cultural adaptability, and degree of personalization. In general, the mHealth tool should not be regarded as an alternative to traditional consulting services, but is more suitable as an auxiliary link in the psychological support system of colleges and universities, covering low-resource environments, support during service waiting, and early screening and self-help management of psychological distress. The research results of this article provide theoretical reference and direction suggestions for the digital transformation of psychological service system of colleges and universities and the selection of intervention tools. This study also has certain limitations. First, most of the literature included comes from high-income countries, and the applicability of the results to culturally diverse people need to be further verified. Second, most of the current studies focus on the short-term intervention effect and lack systematic tracking of the long-term continuous intervention effect and behavioral change maintenance. Future research can further explore the AI-driven personalized intervention model, the human-computer collaborative hybrid service mechanism, and the institutional integration path under the collaboration between universities and developers, so as to promote the extensive deployment and scientific implementation of mHealth tools in actual campus scenarios.

References

- [1] Auerbach, R. P., Mortier, P., Bruffaerts, R., Alonso, J., Benjet, C., Cuijpers, P., Demyttenaere, K., Ebert, D. D., Green, J. G., Hasking, P., Murray, E., Nock, M. K., Pinder-Amaker, S., Sampson, N. A., Stein, D. J., Vilagut, G., Zaslavsky, A. M., & 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>
- [2] Sarokhani, D., Delpisheh, A., Veisani, Y., Sarokhani, M. T., Esmaeli Manesh, R., & Sayehmiri, K. (2013). Prevalence of Depression among University Students: A Systematic Review and Meta-Analysis Study. *Depression Research and Treatment*, 2013(1), 373857. <https://doi.org/10.1155/2013/373857>

- [3] Fitzpatrick, K. K., Darcy, A., & Vierhile, M. (2017). Delivering Cognitive Behavior Therapy to Young Adults With Symptoms of Depression and Anxiety Using a Fully Automated Conversational Agent (Woebot): A Randomized Controlled Trial. *JMIR Mental Health*, 4(2), e7785. <https://doi.org/10.2196/mental.7785>
- [4] Bress, J. N., Falk, A., Schier, M. M., Jaywant, A., Moroney, E., Dargis, M., Bennett, S. M., Scult, M. A., Volpp, K. G., Asch, D. A., Balachandran, M., Perlis, R. H., Lee, F. S., & Gunning, F. M. (2024). Efficacy of a Mobile App-Based Intervention for Young Adults With Anxiety Disorders: A Randomized Clinical Trial. *JAMA Network Open*, 7(8), e2428372. <https://doi.org/10.1001/jamanetworkopen.2024.28372>
- [5] O'Daffer, A., Colt, S. F., Wasil, A. R., & Lau, N. (2022). Efficacy and Conflicts of Interest in Randomized Controlled Trials Evaluating Headspace and Calm Apps: Systematic Review. *JMIR Mental Health*, 9(9), e40924. <https://doi.org/10.2196/40924>
- [6] Sun, S., Lin, D., Goldberg, S., Shen, Z., Chen, P., Qiao, S., Brewer, J., Loucks, E., & Operario, D. (2022). A mindfulness-based mobile health (mHealth) intervention among psychologically distressed university students in quarantine during the COVID-19 pandemic: A randomized controlled trial. *Journal of Counseling Psychology*, 69(2), 157–171. <https://doi.org/10.1037/cou0000568>
- [7] Fulmer, R., Joerin, A., Gentile, B., Lakerink, L., & Rauws, M. (2018). Using Psychological Artificial Intelligence (Tess) to Relieve Symptoms of Depression and Anxiety: Randomized Controlled Trial. *JMIR Mental Health*, 5(4), e9782. <https://doi.org/10.2196/mental.9782>
- [8] Horwitz, A. G., Mills, E. D., Sen, S., & Bohnert, A. S. B. (2024). Comparative Effectiveness of Three Digital Interventions for Adults Seeking Psychiatric Services: A Randomized Clinical Trial. *JAMA Network Open*, 7(7), e2422115. <https://doi.org/10.1001/jamanetworkopen.2024.22115>
- [9] PhD, S. W. (2025, June 1). Why We're Ghosting Mental Health Apps and Finding Solace in AI. *Advances in AI for Mental Health*. <https://medium.com/ai-in-mental-health/why-were-ghosting-mental-health-apps-and-finding-solace-in-ai-c6e54f5d2358>
- [10] Creswell, J. D., & Goldberg, S. B. (2025). The Meditation App Revolution. *The American Psychologist*, 10.1037/amp0001576. <https://doi.org/10.1037/amp0001576>
- [11] Liu, H., Peng, H., Song, X., Xu, C., & Zhang, M. (2022). Using AI chatbots to provide self-help depression interventions for university students: A randomized trial of effectiveness. *Internet Interventions*, 27, 100495. <https://doi.org/10.1016/j.invent.2022.100495>
- [12] Kern, A., Hong, V., Song, J., Lipson, S. K., & Eisenberg, D. (2018). Mental health apps in a college setting: Openness, usage, and attitudes. *mHealth*, 4(6). <https://doi.org/10.21037/mhealth.2018.06.01>
- [13] Bautista, J., & Schueller, S. M. (2023). Understanding the Adoption and Use of Digital Mental Health Apps Among College Students: Secondary Analysis of a National Survey. *JMIR Mental Health*, 10(1), e43942. <https://doi.org/10.2196/43942>
- [14] Naderbagi, A., Loblay, V., Zahed, I. U. M., Ekambareshwar, M., Poulsen, A., Song, Y. J. C., Ospina-Pinillos, L., Krausz, M., Kamel, M. M., Hickie, I. B., & LaMonica, H. M. (2024). Cultural and Contextual Adaptation of Digital Health Interventions: Narrative Review. *Journal of Medical Internet Research*, 26(1), e55130. <https://doi.org/10.2196/55130>