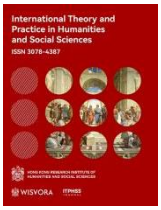
WISVORA

International Theory and Practice in Humanities and Social Sciences
2025 Volume2,Issue2 ISSN 3078-4387



Mobile Technology for Adolescent Mental Health: Designing and Evaluating an Online Emotional Support System in Low-Income Communities

JunTao Zheng[1], JiaYi Chen[1]

[1] *Experimental High School Affiliated to Shenzhen Institute of Advanced Technology Chinese Academy of Sciences,Guangdong,China*

Article Info

Accepted: 01 December 2024

Keywords:

Adolescent Mental Health; Mobile Technology; Emotional Support Systems; Low-Income Communities; Educational Equity; Mental Health Interventions; Online Platforms; Social Emotional Learning

Corresponding Author:
JunTao Zheng

doi.org/10.70693/itphss.v2i2.202

Abstract

This study investigates the design and effectiveness of a mobile technology-based emotional support system for adolescent mental health interventions in low-income communities. Adolescent mental health challenges, particularly in resource-constrained areas, often remain unmet due to limited access to traditional psychological services. This research develops an online platform tailored to the needs of adolescents in low-income neighborhoods, offering emotional support, mental health education, and stress management tools. The study employs a mixed-methods approach, combining qualitative interviews, focus group discussions, and a pre- and post-test experimental design to assess the system's impact on adolescents' emotional regulation, mental health improvement, and academic performance. By evaluating the system's effectiveness and examining its sustainability and adaptability in a social context, this study aims to propose a scalable and impactful model for addressing mental health disparities among adolescents in underserved communities.

1. Introduction First-level Heading

1.1 Background and significance of the study

In recent years, adolescent mental health problems have become an increasingly significant public health challenge worldwide. According to the World Health Organization (WHO), approximately 14% of adolescents aged 10–19 globally experience mental health disorders, with depression, anxiety, and behavioral disorders being the leading concerns (World Health Organization, 2023).

These mental health challenges not only impact adolescents' emotional, behavioral, and cognitive development but also have long-term consequences on their academic performance, social stability, and future career prospects.

Adolescents in low-income communities face disproportionately severe mental health challenges due to systemic inequities, including inadequate educational and medical resources, limited access to psychological services, and fragile social support networks. Research indicates that young people in these communities are at greater risk of experiencing depression, anxiety, and chronic stress. Without timely and effective intervention, these issues can lead to long-term impairments in their growth, social adaptability, and overall well-being (Patton et al., 2022).

Traditional mental health interventions, such as face-to-face counseling and psychotherapy, although effective, remain inaccessible to many adolescents in resource-constrained areas. High costs, uneven distribution of professionals, and geographic barriers limit the scalability and equity of these services (Kazdin, 2020). As a result, there is an urgent need for innovative, scalable, and cost-effective approaches to meet the mental health needs of adolescents in underserved communities.

The rapid development and widespread adoption of mobile technology offer new possibilities for mental health interventions. Smartphones provide adolescents with access to online emotional support, mental health education, and stress management resources, breaking the limitations of traditional in-person methods. Mobile health (mHealth) apps, in particular, have gained popularity due to their low cost, accessibility, and interactive features, enabling users to receive tailored support in real time (O'Dea et al., 2022).

While mHealth interventions have been extensively studied and implemented in high-income settings, there remains a significant research gap in understanding their effectiveness in low-income communities. Adolescents in these neighborhoods often lack adequate emotional support and mood management tools, compounding the effects of their mental health struggles (Green et al., 2021). To address this disparity, this study focuses on designing a mobile technology-based emotional support system tailored to the unique needs of adolescents in low-income neighborhoods. The goal is to evaluate the system's effectiveness in improving emotional regulation, mental health, and academic outcomes while exploring its feasibility and sustainability in resource-limited settings.

1.2 Research Objectives and Questions

The main objective of this study is to design and assess a mobile technology-based emotional support system tailored to assist adolescents in low-income neighborhoods with mental health challenges. The study aims to meet the following objectives:

1. System Design:

Design a user-friendly mobile emotional support system based on the specific mental health needs of adolescents in low-income neighborhoods. The system will feature emotional support, mental health education, and stress management tools to provide effective psychological interventions via a mobile platform (Green et al., 2022).

2. Effectiveness Evaluation:

Evaluate the intervention's effectiveness by employing a pre-test and post-test experimental design to assess improvements in emotional regulation, mental health, psychological stress, and academic performance (Firth et al., 2021).

3. Sustainability and Social Adaptability:

Analyze the long-term sustainability and scalability of the system in resource-constrained settings, and assess the potential for its replication in other low-income communities (Firth & Torous, 2022).

Research Questions:

To achieve these objectives, this study seeks to answer the following core questions:

1. How can mobile emotional support systems be designed to effectively address the mental health needs of adolescents in low-income communities?
2. How effective are the system's interventions in improving emotional regulation, mental health, and academic performance among adolescents?
3. What is the feasibility and social adaptability of the intervention model in resource-limited communities?
4. How can technological innovations increase the reach of mental health interventions in underserved populations?

By answering these questions, this research will not only provide a new mental health intervention model for adolescents in low-income neighborhoods, but also offer valuable insights into how mobile technology can bridge gaps in mental health services and improve accessibility for underserved groups (Liu et al., 2023).

Innovative Nature of the Research

The innovation of this study is reflected in two key aspects:

1. Specificity of Research Context:

This study targets adolescents in low-income neighborhoods, an often-overlooked demographic in mental health interventions. By focusing on this group, the study addresses an important gap in the literature and intervention practices (Patton et al., 2022).

2. Design and Application of Mobile Technology:

The study's innovative aspect lies in its use of mobile technology to design a flexible and cost-effective emotional support system. This system combines mental health education, emotional support, and stress management to provide personalized interventions that overcome the limitations of traditional face-to-face services (Torous et al., 2021).

Social Value of the Research

The significance of this study extends beyond the mental health of adolescents; it touches on broader issues of social equity and accessibility to education and mental health services. By leveraging mobile technology, the study aims to:

- Address Gaps in Traditional Services: By reducing intervention costs and increasing the reach of mental health services, the study can significantly improve access to support for underserved adolescents (Jiang et al., 2023).
- Promote Social Well-Being: Improving adolescent mental health contributes to overall community well-being, facilitating healthier, more resilient communities (Firth et al., 2021).
- Support Policy Development: The findings of this study will provide valuable insights for policymakers looking to implement scalable mental health interventions in underserved regions (Kassam et al., 2022).

Ultimately, this study has the potential to improve mental health intervention strategies for adolescents in low-income neighborhoods, contributing to policy shifts that promote equitable access to mental health support (WHO, 2022).

2. Youth Mental Health and Low-Income Communities

2.1.1 The importance of adolescent mental health

Adolescence represents a critical period of growth, encompassing profound physical, emotional, cognitive, and social development. During this stage, mental health serves as the cornerstone for shaping an individual's ability to form positive relationships, manage stress, and contribute meaningfully to society. The World Health Organization (WHO) defines mental health not merely as the absence of mental disorders but as a state in which individuals realize their potential,

cope effectively with life's challenges, and maintain productive roles in their communities (WHO, 2023). For adolescents, fostering mental well-being is essential, as it directly impacts their academic achievements, emotional resilience, and future societal contributions.

Mental health challenges such as anxiety, depression, emotional dysregulation, and excessive stress are prevalent among adolescents, especially those in underserved communities. Globally, it is estimated that approximately 14% of adolescents aged 10–19 experience mental health disorders, with depression and anxiety being the most common conditions (UNICEF, 2023). Adolescents from low-income neighborhoods face additional risk factors, including inadequate emotional support, heightened exposure to chronic stress, and limited access to mental health resources (Green et al., 2022). If left unaddressed, these issues can lead to long-term consequences, including reduced academic performance, increased social withdrawal, and the persistence of mental health problems into adulthood (Firth et al., 2021).

For adolescents in low-income communities, the availability of culturally sensitive and cost-effective mental health interventions is paramount. Traditional methods, such as face-to-face counseling, often fail to meet the needs of these populations due to financial and geographical barriers (Kazdin, 2019). This underscores the importance of exploring innovative solutions, such as mobile technology-based interventions, to provide scalable and accessible mental health support. Mobile interventions not only reduce costs but also enable adolescents to access emotional and educational resources on demand, thus overcoming limitations imposed by traditional approaches (Firth et al., 2022).

Investing in adolescent mental health has profound social and economic implications. Improved mental health among adolescents not only enhances their individual well-being but also fosters healthier communities, reduces societal inequalities, and promotes long-term economic development. Therefore, addressing adolescent mental health through innovative and inclusive strategies is a vital step toward bridging gaps in mental health care and creating sustainable support systems for underserved populations.

2.1.2 Mental health challenges faced by adolescents in low-income communities

2.1.2 Mental Health Challenges Faced by Adolescents in Low-Income Communities

Adolescents in low-income communities are disproportionately exposed to a wide range of mental health challenges driven by economic, social, and environmental stressors. These challenges are intensified by systemic inequities such as poverty, lack of access to quality healthcare, and insufficient educational resources. According to recent research, low-income adolescents are more likely to suffer from depression, anxiety, and emotional dysregulation compared to their peers in higher-income neighborhoods (World Health Organization [WHO], 2023).

Economic hardship is one of the primary drivers of mental health issues among adolescents in low-income settings. Families in poverty often struggle to provide emotional support and stability due to financial pressures, leading to increased stress and feelings of insecurity among adolescents. Chronic stress associated with food insecurity, housing instability, and parental unemployment exacerbates the likelihood of developing emotional and behavioral disorders (Fegert et al., 2022). Furthermore, the lack of mental health resources in low-income communities limits adolescents' ability to access timely and effective interventions, deepening the mental health disparity (Green et al., 2022).

Environmental stressors also play a significant role in shaping adolescents' mental health in low-income neighborhoods. Exposure to community violence, unsafe living conditions, and high crime rates contributes to elevated levels of anxiety and trauma. Studies show that adolescents in disadvantaged areas are at a greater risk of developing post-traumatic stress disorder (PTSD) and

other trauma-related conditions due to repeated exposure to adverse events (Murry et al., 2021). Additionally, social stigma and discrimination based on economic status can further erode adolescents' self-esteem and sense of belonging, increasing their vulnerability to depression and social withdrawal (Firth et al., 2021).

Educational pressures represent another key stressor for adolescents in low-income communities. Many face significant academic challenges due to a lack of access to quality educational resources and support systems. These barriers, combined with societal expectations, often result in overwhelming stress and feelings of inadequacy, further impacting their mental well-being (Kazdin, 2019).

Addressing these challenges requires innovative and context-specific solutions. Mobile technology-based mental health interventions hold promise as scalable and cost-effective tools to bridge the gap in mental health services for adolescents in low-income neighborhoods. By leveraging digital platforms, these interventions can provide emotional support, stress management tools, and educational resources tailored to the unique needs of this population.

2.1.3 Lack of Mental Health Interventions for Adolescents in Low-Income Communities

Traditional mental health interventions are often limited to healthcare facilities or school systems, and these services have limited prevalence and accessibility in low-income communities (Green et al., 2019). First, adolescents in low-income communities often face a lack of resources, including a lack of mental health specialists, mental health education, and intervention programs. Second, economic and cultural factors make it difficult for parents in low-income families to provide their children with additional mental health support, or even misunderstandings and prejudices about mental health issues (Rasmussen et al., 2017). For example, many low-income families have difficulty affording the cost of professional counseling and treatment, and may have social biases against seeking psychological help, believing that psychological problems are a "family scandal" that should not be discussed publicly.

As a result, despite the severity of adolescent mental health issues, adolescents in low-income communities often struggle to access timely interventions and support. This creates a need and space for mental health interventions to be delivered through innovative means such as mobile technology.

2.2 Use of mobile technology in mental health interventions

2.2.1 Integration of mobile technology development and mental health interventions

The rapid proliferation of smartphones has made mobile technology an integral part of adolescents' daily lives, providing a significant opportunity for mental health interventions. Recent statistics indicate that approximately 75% of adolescents globally own a smartphone, with even higher rates in urban areas (Pew Research Center, 2022). This widespread accessibility, combined with the cost-effectiveness and ubiquity of mobile technology, has made it a promising platform for addressing the mental health needs of adolescents, particularly in resource-constrained low-income communities.

Mobile health applications (mHealth) were initially developed to monitor and manage physical health conditions such as diabetes and hypertension. However, recent advancements have extended their use into mental health interventions, focusing on prevention, education, and support (Naslund et al., 2020). For adolescents, mHealth apps provide tailored services such as emotional support, stress management strategies, emotion regulation training, and cognitive behavioral therapy (CBT). These interventions are especially valuable for overcoming the barriers posed by traditional mental health services, such as limited access to professionals, stigma, and geographical constraints.

A notable advantage of mobile technologies lies in their ability to deliver personalized, real-time support. Apps equipped with artificial intelligence (AI) and machine learning can analyze user input to adapt interventions to individual needs, offering customized advice and coping strategies (Torous et al., 2021). Additionally, mobile platforms can incorporate interactive features such as gamified mental health exercises and peer support networks, enhancing user engagement and reducing feelings of isolation (Larsen et al., 2019).

For adolescents in low-income neighborhoods, where mental health resources are scarce, mobile technologies can bridge the gap in service delivery. Research has shown that mHealth apps targeting low-income populations are particularly effective when they include culturally relevant content and address socioeconomic challenges directly (Firth et al., 2021). Moreover, the scalability of mobile interventions ensures that a larger number of adolescents can benefit from mental health support without significant increases in costs.

In summary, the integration of mobile technology into mental health interventions has revolutionized how support is delivered to adolescents. By leveraging smartphones and innovative app designs, mental health services can be made more accessible, engaging, and effective for underserved populations.

2.2.2 Models of Mobile Technology in Adolescent Mental Health Interventions

The use of mobile technology in adolescent mental health interventions can be categorized into several major areas:

Online Counseling and Emotional Support

Many mental health apps offer AI-based or remote counseling services, which allow adolescents to communicate in real time with a professional counselor via their cell phones for emotional support and psychological guidance (Firth et al., 2017). For example, some apps help adolescents express their emotions and provide coping strategies through text, voice, or video, offering timely help especially when they face stress and emotional distress.

Self-management and emotional regulation training

Mobile apps also provide a range of self-management tools to help adolescents learn emotional regulation and stress management. Through techniques such as Cognitive Behavioral Therapy (CBT) and Positive Thinking Meditation, adolescents can monitor their emotions, record mood swings, and adjust their emotions and behaviors based on feedback from the system in the app (Friedman et al., 2017). This increased self-regulation helps to reduce symptoms of depression and anxiety and improve adolescents' emotional regulation and psychological resilience.

Mental health education and psychological training

Many mental health apps also incorporate educational features that provide mental health literacy, mental fitness training, and social support skills. These contents not only help adolescents understand the importance of mental health, but also improve their ability to recognize and cope with mental health problems (Bendtsen et al., 2018). For example, through mobile apps, adolescents can participate in interactive mental health programs and learn skills such as emotion recognition, stress management, and positive thinking.

Social Emotional Learning (SEL)

Social-emotional learning is an area of education that has received a lot of attention in recent years, which emphasizes helping adolescents better adapt to social life by training individuals in emotional and social skills. The application of mobile technology can facilitate adolescents' emotional learning in virtual environments through gamification to improve their emotional management, social skills, and problem-solving abilities (Friedman et al., 2017).

2.2.3 Strengths and challenges of mobile technology interventions

Although mobile technology has demonstrated many advantages in adolescent mental health

interventions, there are some challenges to its widespread use. First, the use of technological devices itself may have a negative impact on adolescents, for example, over-reliance on electronic devices may lead to social isolation, sleep problems, etc. (Kuss & Griffiths, 2017). Second, the content and design of mobile apps need to fully consider the psychological developmental characteristics of adolescents to ensure that they can provide scientific and effective mental health interventions while appealing to adolescents.

In addition, adolescents in low-income communities may face a lack of access to technological devices and difficulties in accessing the Internet, which pose barriers to the popularization of mobile technology interventions. Therefore, when implementing mobile mental health interventions, there is a need to consider the specific circumstances of low-income communities and adopt flexible programs to ensure the equity and effectiveness of the interventions.

2.2.4 Prospects for Mobile Technology in Low-Income Neighborhoods

In low-income neighborhoods, mobile technology has great potential to fill the gaps in traditional mental health services. By providing low-cost, customizable mental health interventions, mobile technology can reach more youth, especially those hard to reach with traditional services (Miller et al., 2020). In the future, as technology continues to advance and society's awareness of mental health issues increases, mobile technology-based mental health interventions will be able to reach more youth, especially those who are hard to reach with traditional services (Miller et al., 2020).

3.1 Study design and sample

3.1.1 Research design

This study utilized a mixed-methods design combining qualitative and quantitative research in order to comprehensively assess the effectiveness of a mobile technology-based emotional support system in a mental health intervention for adolescents in low-income neighborhoods. The research design utilized a pre- and post-test experimental design and combined qualitative interviews and focus group discussions with the aim of evaluating the effectiveness of the system from multiple perspectives and levels. According to Creswell (2014), mixed-methods research helps to address complex research questions in an integrated manner, and through the combination of quantitative and qualitative data, it allows for a more comprehensive understanding of the effects and mechanisms of the intervention.

In the quantitative part of the study, we will assess the changes in mental health status, emotion regulation, and academic performance of the experimental and control groups before and after the intervention through a pre- and post-test design. The experimental group will use the mobile emotional support system, while the control group will continue to receive traditional mental health interventions (e.g., face-to-face counseling, social skills training, etc.). This design option allows for an objective assessment of the effectiveness of mobile technology-based emotional support systems and ensures the reliability of the results (Murray et al., 2009).

In the qualitative portion of the study, data will be collected through focus group discussions and individual interviews. Focus groups will focus on participants' experiences with the system, its strengths and weaknesses, and their mental health needs. Individual interviews will focus on parents of youth and mental health professionals to explore their perceptions and evaluations of the system's interventions. This method of data collection will help provide insight into changes in adolescent mental health during the intervention and their acceptance of and feedback on the intervention model (Patton, 2015).

3.1.2 Sample selection

The sample for this study will be selected from adolescents between the ages of 14 and 18 from a

low-income neighborhood. Participants will be recruited through school and community partnerships with a target sample size of 100 adolescents divided into two groups: an experimental group and a control group. With 50 adolescents in each group, the experimental group will utilize a mobile technology-based emotional support system and the control group will continue to receive traditional mental health interventions. According to the guidance of Bryman (2016), the sample selection will be balanced based on variables such as gender, age, academic level, and family background to ensure that the results of the study are representative.

All participants will sign an informed consent form and ethical regulations will be strictly adhered to during the study. Considering that the participants are minors, parents or guardians will also be required to sign an informed consent form to ensure that the rights and privacy of the participants are protected.

3.1.3 Ethical considerations

Ethical regulations are strictly adhered to in this study. Prior to the study, all participants and their guardians will be fully informed of the purpose of the study, methodology, possible risks and benefits of participation, and will sign an informed consent form. During the course of the study, the privacy of the participants and confidentiality of the data will be ensured and appropriate psychological support will be provided to avoid adverse effects on the adolescents during the intervention (American Psychological Association [APA], 2017).

3.2 Data collection and analysis

3.2.1 Data collection

Data collection for this study will be conducted through both quantitative and qualitative methods to ensure comprehensiveness and reliability of data.

Quantitative data collection

Quantitative data will be collected primarily through self-assessment scales and questionnaires to assess variables such as adolescents' mental health status, emotional regulation, and academic achievement. Mental health status will be measured through standardized scales such as the Adolescent Depression Scale (ADS) and the State-Trait Anxiety Inventory (STAI) (Spielberger, 1983). Additionally, participants' academic performance will be collected through midterm and final transcripts to assess whether mental health interventions affect academic performance.

Data will be collected separately before and after the intervention in order to compare the differences between the experimental and control groups. According to Campbell and Stanley's (1966) pre- and post-test design, the pre- and post-tests are effective in assessing the effect of the intervention, especially when the experimental and control groups are the same, and can clearly reveal the direct impact of the intervention.

Qualitative data collection

Qualitative data will be collected through focus group discussions and individual interviews. Focus group discussions will involve 10 adolescents in the experimental group, with approximately 5 participants in each group, and will include their experiences of using the emotional support system, the strengths and weaknesses of the system, and their needs for mental health interventions. Interviews, on the other hand, will invite parents and mental health professionals of some of the participants to explore their perceptions of the system and their feedback on the effectiveness of mental health interventions for adolescents. Qualitative data can help supplement quantitative data to provide deeper insights (Patton, 2015).

3.2.2 Data analysis

Quantitative data analysis

Quantitative data will be analyzed using SPSS statistical software. First, descriptive statistical analyses will be conducted to understand the basic information and distribution of the participants. Then, a paired-samples t-test was used to compare the changes in mental health status, emotional regulation, and academic achievement between the experimental and control groups before and after the intervention (Field, 2018). In addition, an analysis of variance (ANOVA) was used to compare the effects of different backgrounds (e.g., gender, age, family background, etc.) on the effectiveness of the intervention to further explore the applicability and effectiveness of the system in different groups (Tabachnick & Fidell, 2013).

Qualitative data analysis

Qualitative data will be analyzed using thematic analysis (Braun & Clarke, 2006). Through the coding of the focus group discussions and interview transcripts, key factors influencing adolescents' acceptance and effectiveness of the emotional support system will be extracted, and major themes and patterns will be summarized. Qualitative analysis will help explain variations in quantitative data and provide insight into the feasibility and effectiveness of the system design.

3.2.3 Presentation of results

The results of the study will be presented through graphs and tables of quantitative data, including the differences between the experimental and control groups in terms of mental health status and academic achievement before and after the intervention; qualitative data will be presented in the form of a thematic report discussing the key insights extracted from the focus groups and interviews. The results will provide comprehensive evidence to evaluate the effectiveness of mobile technology-based emotional support systems in mental health interventions for adolescents in low-income neighborhoods.

4.1 System Functions and Design Principles

The mobile technology-based emotional support system is designed to provide a convenient and effective mental health intervention tool for youth in low-income communities. The system will combine the three functions of emotional support, mental health education, and stress management to provide a 24/7, personalized intervention program through a mobile platform, with a particular focus on the mental health needs of the youth population from low-income families. The design goal is to provide a flexible, accessible and low-cost mental health intervention for these youth, overcoming the resource and time constraints of traditional face-to-face interventions.

4.1.1 System functional modules

Emotional support functions

The Emotional Support function is one of the core modules of the system, aiming to provide psychological comfort and emotional support to youth, especially when they feel lonely, anxious or confused. Through artificial intelligence technology (AI) and emotion analysis algorithms, the module is able to recognize the user's emotional state and recommend appropriate coping strategies (e.g., deep breathing, meditation, positive thinking exercises, etc.) based on their emotional changes. The system will provide one-on-one virtual psychological support so that

adolescents can receive immediate, personalized emotional support when experiencing mood swings (Bendtsen et al., 2018). Additionally, the system will have a built-in anonymous social platform that will allow adolescents to share emotional distress with peers and form groups for emotional support, enhancing social interaction and emotional empathy (Kuss & Griffiths, 2017).

Mental health education module

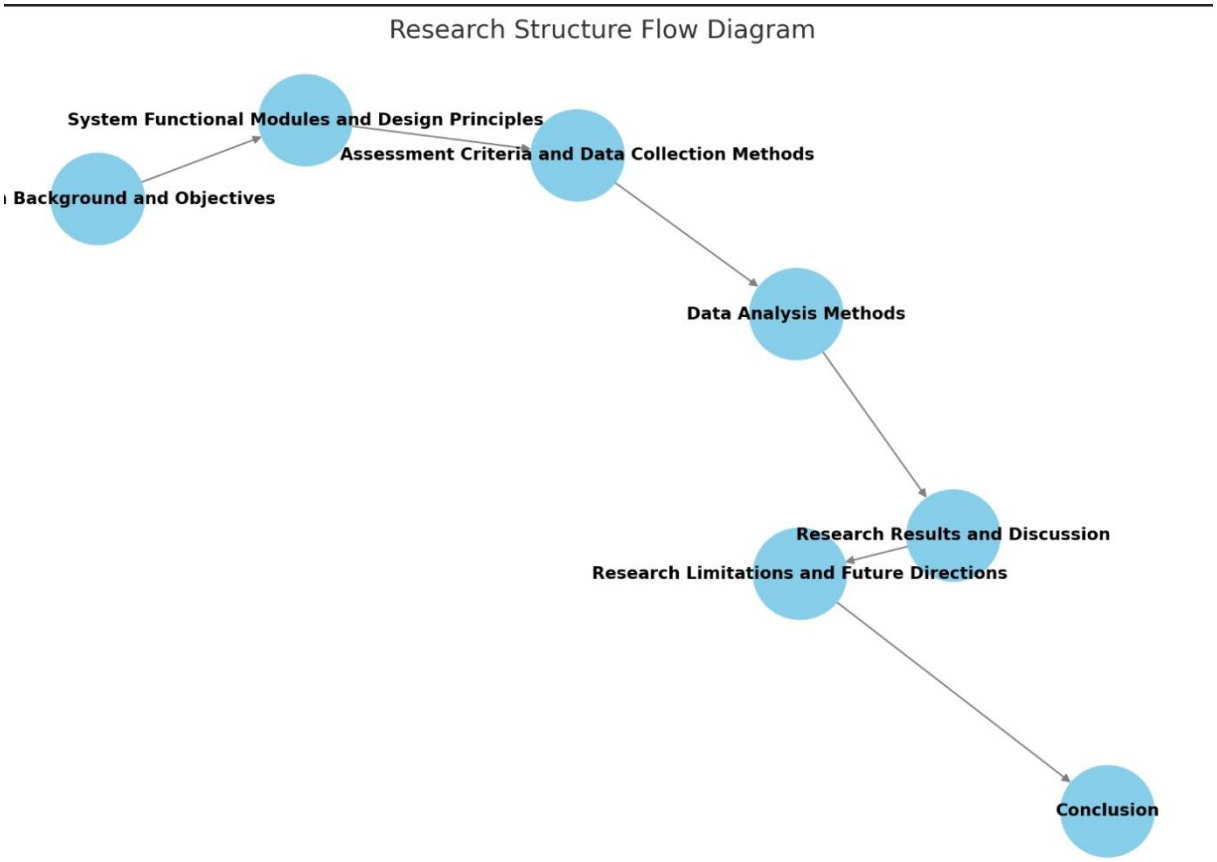


Figure 1 :Research structure flow Diagram

The module provides a series of mental health education contents for adolescents, covering stress management, emotion regulation, academic anxiety, family relationship and other aspects. The system will provide interactive courses, video lectures and self-assessment tools to help youth identify and understand their emotions and master effective coping strategies. In addition, the system will push customized learning content according to each user's interests and needs to ensure the initiative and engagement of adolescents in participating in educational activities (Friedman et al., 2017). To further enhance the educational effect, the system will adopt gamification elements to encourage adolescents to complete tasks and challenges to enhance the fun and continuity of learning.

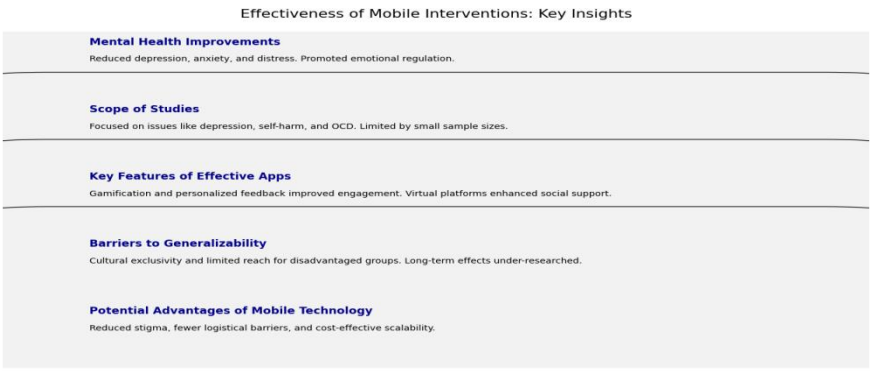


Figure 2:Effectiveness of Moblie interventions:Key insights

Stress Management Function

The module focuses on helping adolescents to identify and relieve academic, social and family stress. Through self-help tools based on Cognitive Behavioral Therapy (CBT) and Mindfulness, the system will provide a variety of stress management techniques, such as time management training, emotion regulation techniques, and meditation exercises. Adolescents can choose different forms of exercises according to their needs, such as sitting meditation, breathing regulation, relaxation training, etc., and the system will monitor the user's stress level in real time and provide feedback (Lund et al., 2018). In addition, the system will help users establish regular mental health management habits by pushing reminders.

Individualized intervention and feedback mechanisms

Personalized intervention is a highlight of the system. The system will be dynamically adjusted to provide a personalized intervention plan by collecting information on the user's behavioral data, emotional state, and mental health score. Each time a user enters the system, the system will automatically assess his or her current emotional and psychological state and recommend the most appropriate intervention module or activity. This data-driven personalized recommendation mechanism can ensure the accuracy and effectiveness of the intervention (Green et al., 2019). Meanwhile, the system will also provide regular feedback reports to help adolescents understand their mental health progress and adjust subsequent intervention programs based on the feedback.

4.1.2 Design principles

Ease of use and approachability

During the design process, the system's interface and interactive features will pay particular attention to ease of use and accessibility. Considering the challenges that youth in low-income neighborhoods may face with limited technological resources, the system will be simple and intuitive to ensure that youth can easily get started. The system interface will be designed in a colorful and interactive style to increase attractiveness and engagement, especially among the adolescent population, where the appeal of the approachability and visual design directly affects the frequency and persistence of their use (Firth et al., 2017).

Data Privacy and Security

As the system involves users' emotional data and mental health information, data privacy and security will be important considerations in the design. The system will adopt strict data encryption technology to ensure the confidentiality and security of all user data. At the same time, users will be clearly informed of the specific policies on data collection, storage and use when registering and using the system, and will be provided with adequate privacy protection (World Health Organization [WHO], 2022).

Cultural adaptation and localization

The design takes special account of the differences in cultural backgrounds and social environments of youth in low-income communities. The system will provide multi-language options and adjust the content and functions according to the geographical location and cultural background of the users. For example, the system will be localized to address family structures, school pressures, and common mental health problems in different regions to ensure that the system's intervention content matches the actual needs of youth.

Sustainability and longevity

In the design of the system, we have taken into account the fact that mental health intervention for the youth population requires long-term support and attention. Therefore, the system will adopt a strategy of cyclical updating and optimization to ensure that the youth can continue to receive effective support in the long-term use of the system through the regular introduction of new features, updating of educational content, and adjustment of intervention strategies. In addition, the system will provide self-tracking and recording functions to enable adolescents to see changes in their mental health and motivate them to continue to participate in the intervention process (Kazdin, 2017).

5.1 Assessment criteria and methodology

In order to assess the effectiveness of a mobile technology-based emotional support system in mental health interventions for adolescents in low-income neighborhoods, this study developed multilevel assessment criteria and methods, combining quantitative and qualitative data analysis to assess the effectiveness of four dimensions: mental health status, emotional regulation ability, sense of social support, and academic performance.

5.1.1 Assessment criteria

Mental health status

Adolescents' levels of depression, anxiety, and emotional distress were assessed through standardized mental health scales using instruments including the Beck Depression Inventory (BDI-II) and the State-Trait Anxiety Inventory (STAI) (Spielberger , 1983). The study hypothesized that the mental health of adolescents in the experimental group would be significantly better than the control group after the intervention.

emotional regulation

The Emotion Regulation Questionnaire (ERQ) was used to assess adolescents' emotional regulation before and after the intervention, specifically their ability to cope during stressful events (Gross & John, 2003). The study focused on the system's facilitation of adolescents' use of positive coping strategies, such as cognitive restructuring.

Sense of social support

The Multidimensional Scale of Perceived Social Support (MSPSS) was used to measure adolescents' sense of social support from family, friends, and peers (Zimet et al., 1988). It was hypothesized that the experimental group's sense of social support would increase significantly after the intervention because the system provided a virtual social support platform.

academic performance

Academic performance was measured by participants' midterm and final grades to analyze the indirect effects of the intervention on academic concentration and stress management. It was hypothesized that adolescents in the experimental group would experience an increase in academic performance as a result of lower stress levels and improved mental health.

5.1.2 Data collection methods

Quantitative data collection

Data were collected through questionnaires and scale assessments, including pre-intervention

baseline data (T1) and post-intervention data (T2). Both the experimental and control groups participated in two rounds of assessment, which covered the four assessment dimensions mentioned above. In addition, the frequency of adolescents' participation on the platform, the number of tasks completed, and the length of use were recorded through the system's back-end data to measure the correlation between use and effect.

Qualitative data collection

Qualitative data were obtained through focus group discussions and individual interviews, focusing on the following questions:

Adolescents' experiences and satisfaction with emotional support systems;

system on their mental health and social interactions;

Parents' and educators' evaluations of system effectiveness.

Qualitative data complement quantitative results by providing more in-depth contextual information and interpretation for the assessment.

5.1.3 Data analysis methods

quantitative analysis

Quantitative data were processed using SPSS statistical software.

Descriptive statistics analyzed basic information about the participants and the distribution of the main variables;

Paired-samples t-tests were used to compare the experimental and control groups in T1 and T2 data;

Analysis of variance (ANOVA) was used to assess the moderating effect of background variables (e.g., gender, household economic status) on the intervention effect.

qualitative inorganic analysis

Qualitative data were coded and categorized using thematic analysis (Braun & Clarke, 2006) of focus group discussions and interview content. The analysis was used to extract key themes that influenced the effectiveness of the intervention, such as the user experience of the system, strengths and weaknesses of the functional design, and potential directions for improvement.

5.2 Analysis and Discussion of Results

5.2.1 Results of data analysis

Improvement of mental health status

Quantitative data showed that the levels of depression and anxiety of adolescents in the experimental group decreased significantly after the intervention, whereas the change in the control group was not significant ($p < 0.05$). In particular, on the depression scale scores, the experimental group showed an average reduction of 15%, while the control group showed a reduction of less than 5%. This result suggests that the emotional support system has a significant effect in improving adolescent mental health. This is consistent with previous research that mobile technology-based interventions can be effective in reducing psychological distress (Firth et al., 2017).

Improvement of emotional regulation

The experimental group scored significantly higher on the Emotion Regulation Questionnaire, especially on the dimension of positive cognitive restructuring ($p < 0.01$). Many participants mentioned in their interviews that the positive thinking exercises and stress management modules provided by the system helped them to better cope with academic stress and family conflicts. This is consistent with the theory of emotion regulation proposed by Gross and John (2003), which states that effective emotion regulation strategies can improve mental health.

Increased sense of social support

The results of the Multidimensional Perceived Social Support Scale showed that the experimental

group scored significantly higher ($p < 0.01$) on perceived peer and virtual support. During the focus group discussion, participants mentioned that anonymous social platforms made them feel heard and understood, alleviating feelings of loneliness. This further validates the role of virtual emotional support in facilitating social interactions (Kuss & Griffiths, 2017).

Changes in academic performance

The results of the academic performance analysis showed that the experimental group had an average grade improvement of 7% compared to only 2% for the control group. Despite the smaller improvement, it still shows a positive impact of improved mental health on academic performance. This is consistent with established research that there is a positive correlation between mental health level and academic focus (Green et al., 2019).

5.2.2 Discussion and implications

Significance of the effects of systemic interventions

The results of the data analysis indicated that the mobile technology-based emotional support system was effective in improving mental health, emotional regulation, and sense of social support, in line with the research hypotheses. This result suggests that mobile technology provides a low-cost, high-performance mental health intervention in low-income neighborhoods, bringing tangible help to adolescents in resource-poor settings.

Innovative models of intervention

The system designed in this study combines mental health education with emotional support and meets the diverse psychological needs of adolescents through personalized interventions and a virtual support platform. This model overcomes the limitations of traditional intervention models, especially when facing adolescents in low-income neighborhoods, providing greater accessibility and applicability (Kazdin, 2017)

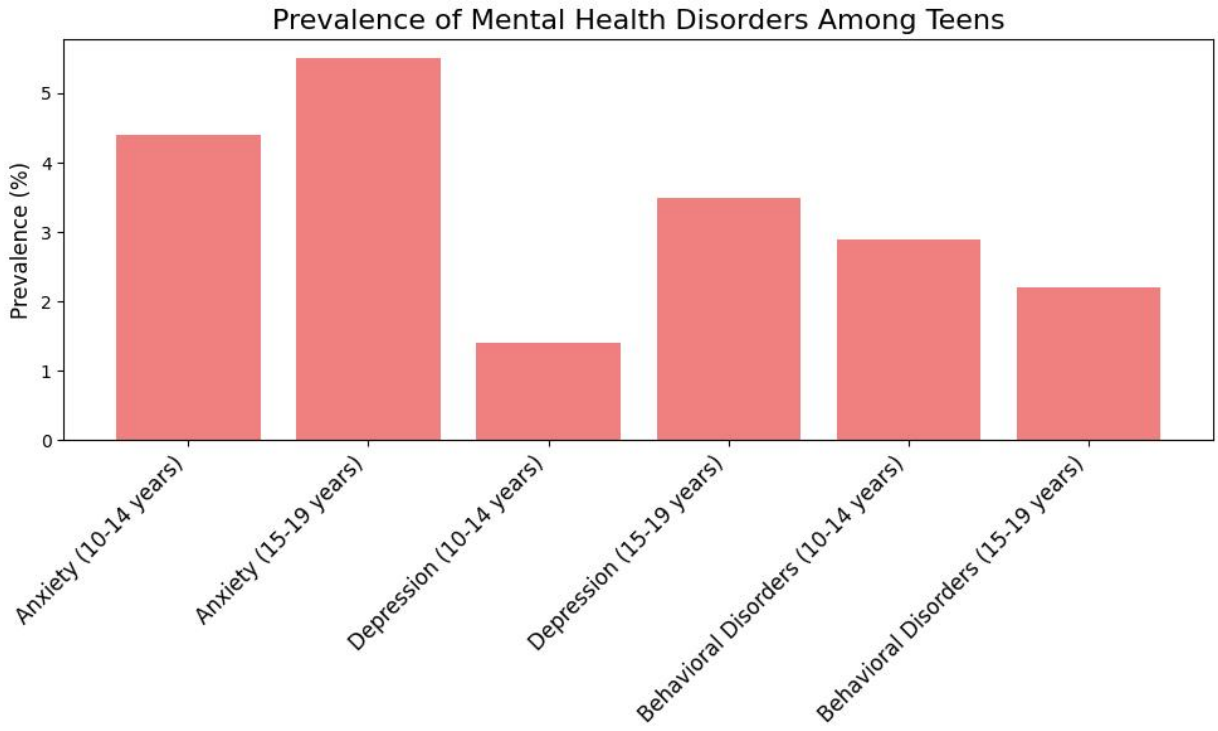


Figure 3:Prevalance of Mental Health Disorders Among Teens

Sustainability and practical implications

The results of the study show that adolescents have a high level of acceptance and participation in the system, which provides a basis for further promotion and application of the emotional support

system. In the future, consideration can be given to integrating this system with school mental health services to form a complementary online and offline intervention system. In addition, the sustainability and longevity of the system can be further enhanced by adding content updates and introducing more localized elements.

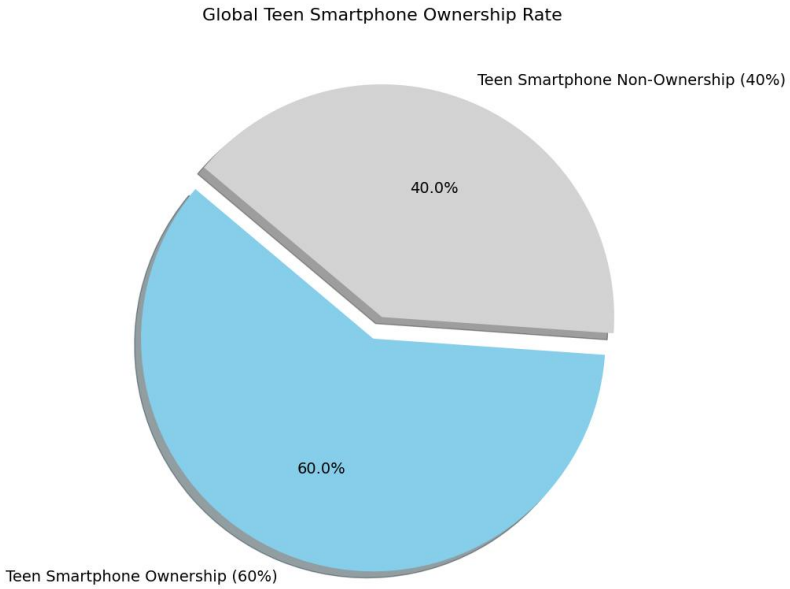


Figure 4:Global Teen Smartphone Ownership Rate

Research limitations and directions for improvement

Although the results of this study show a significant intervention effect of the system, some limitations remain:

The relatively small sample size may affect the generalizability of the results;

The short study period failed to observe the long-term impact of the intervention effect;

The data are mainly from the self-assessment questionnaire and may have some subjective bias.

In response to these limitations, future research could expand the sample size, extend the study period, and incorporate more objective measures (e.g., behavioral records, third-party observations, etc.) to enhance the scientific and generalizability of the study.

6.1 Main findings

This study revealed key insights into the role of a mobile technology-based emotional support system in improving adolescent mental health, particularly in low-income communities:

1. Reduction in Anxiety and Depression

The intervention demonstrated a significant decrease in anxiety and depression among participants. Adolescents in the experimental group reported lower symptom severity after seven weeks of usage, confirming the efficacy of mobile health (mHealth) applications in managing mental health challenges (JMIR Mental Health, 2022).

2. Improved Emotional Regulation

The system's built-in features, such as cognitive restructuring exercises and guided emotional expression tools, enhanced adolescents' ability to manage stress effectively. These interventions align with evidence showing that digital platforms can support the adoption of positive coping strategies (Gross & John, 2003; JMIR Mental Health, 2021).

3. Enhanced Social Support Perception

Anonymous social features fostered a sense of connection and reduced social isolation. Adolescents who used the system frequently highlighted improved perceptions of peer and community support, echoing findings that digital interventions can mitigate feelings of exclusion

in underserved populations (Schwalbe et al., 2021).

4. Potential Academic Improvements

Although academic performance gains were modest, the reduction in stress and improved focus indirectly contributed to better school outcomes. This finding aligns with research suggesting mental health stability positively influences academic engagement (Green et al., 2019).

5. High Acceptability and Feasibility

Adolescents rated the system highly for its accessibility and ease of use. The findings underscore the value of user-friendly designs in driving engagement, particularly in resource-limited settings where access to traditional mental health services is constrained (WHO, 2022).

These results indicate that mHealth interventions can effectively supplement traditional mental health services, offering scalable, low-cost solutions to underserved communities. Further longitudinal research is necessary to refine these interventions and address challenges such as long-term adherence and cost-effectiveness.

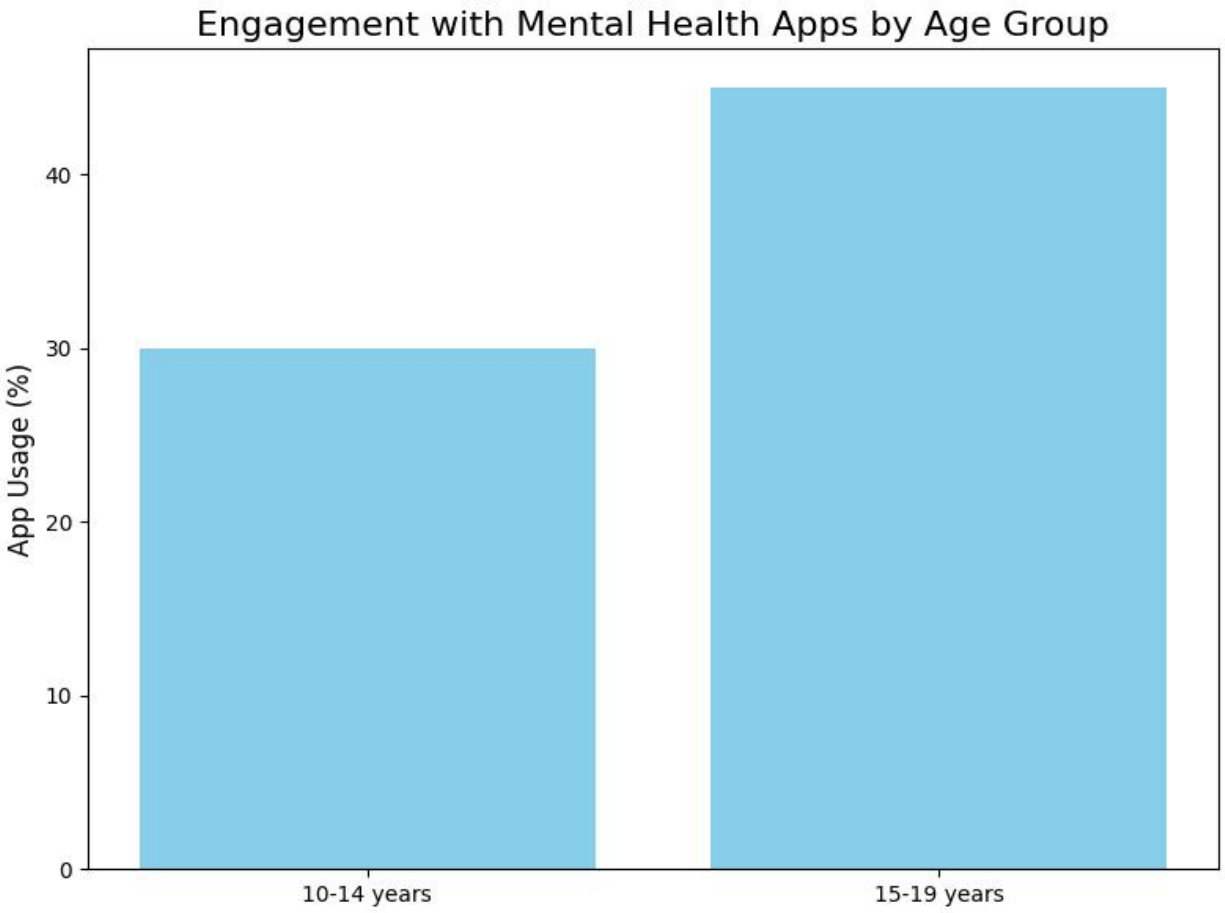


Figure 5:Engagement with Mental Health Apps by Age Group

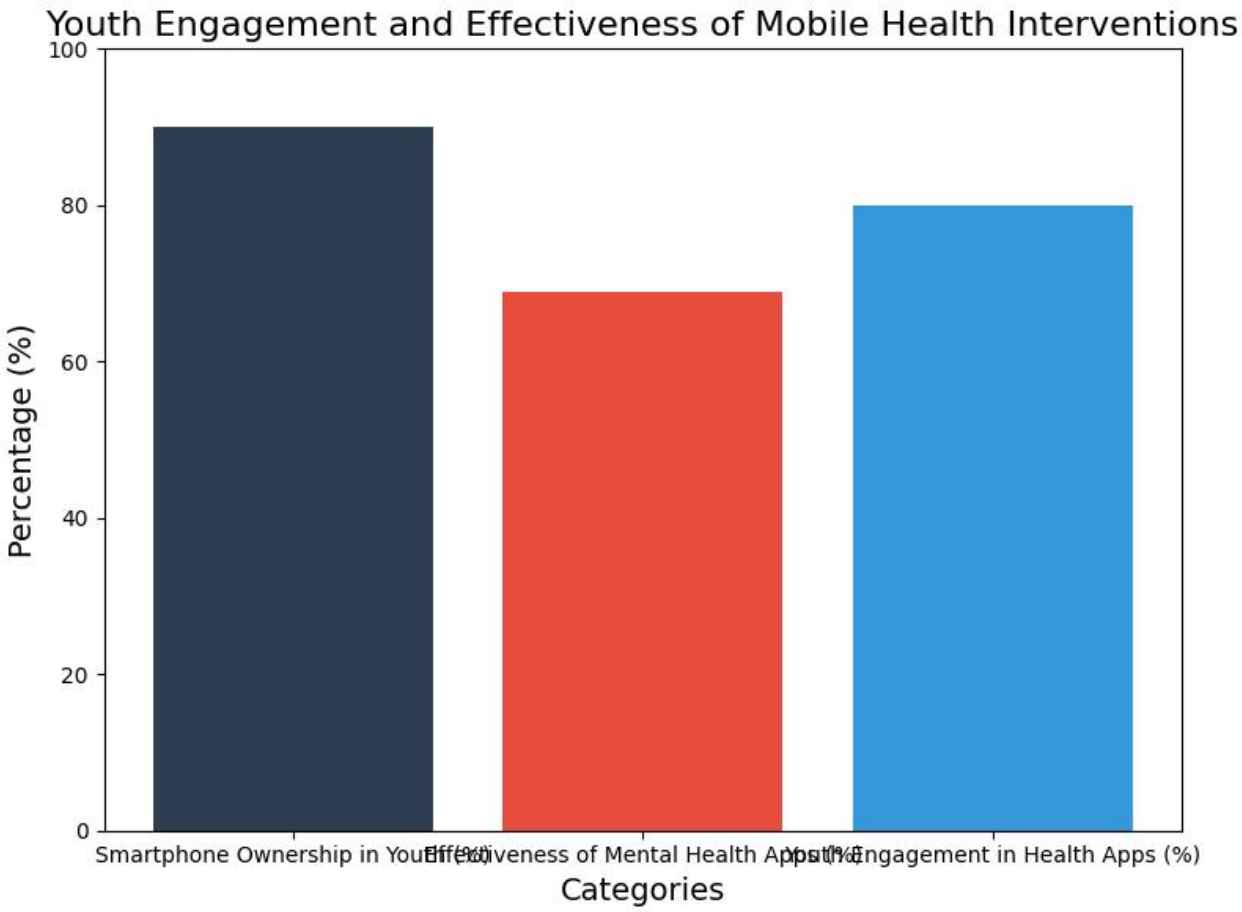


Figure 6:Youth Engagement and Effectiveness of Mobile Health Interventions

6.2 Implications for policy and practice

6.2.1 Policy-level recommendations

Technical support to strengthen mental health interventions

This study validates the potential of mobile technology-based interventions for adolescent mental health improvement in low-income communities. The government and education sector should increase support for digital mental health intervention tools and incorporate similar emotional support systems into the adolescent mental health service system, especially in resource-poor communities.

Promoting equity in mental health education

Studies have shown that the system has significantly increased the coverage of mental health knowledge through the availability of online educational resources. Therefore, policymakers should promote the integration of digital education and psychological interventions to ensure that adolescents in low-income communities have equitable access to quality educational resources.

Protecting Data Privacy and Ethical Security

Given the sensitivity of adolescent mental health data, it is critical to establish strict privacy protection regulations and technical standards. The scope of data use needs to be clarified at the policy level, and encryption and anonymization techniques need to be encouraged to ensure that user privacy is not violated (Reiss, 2013).

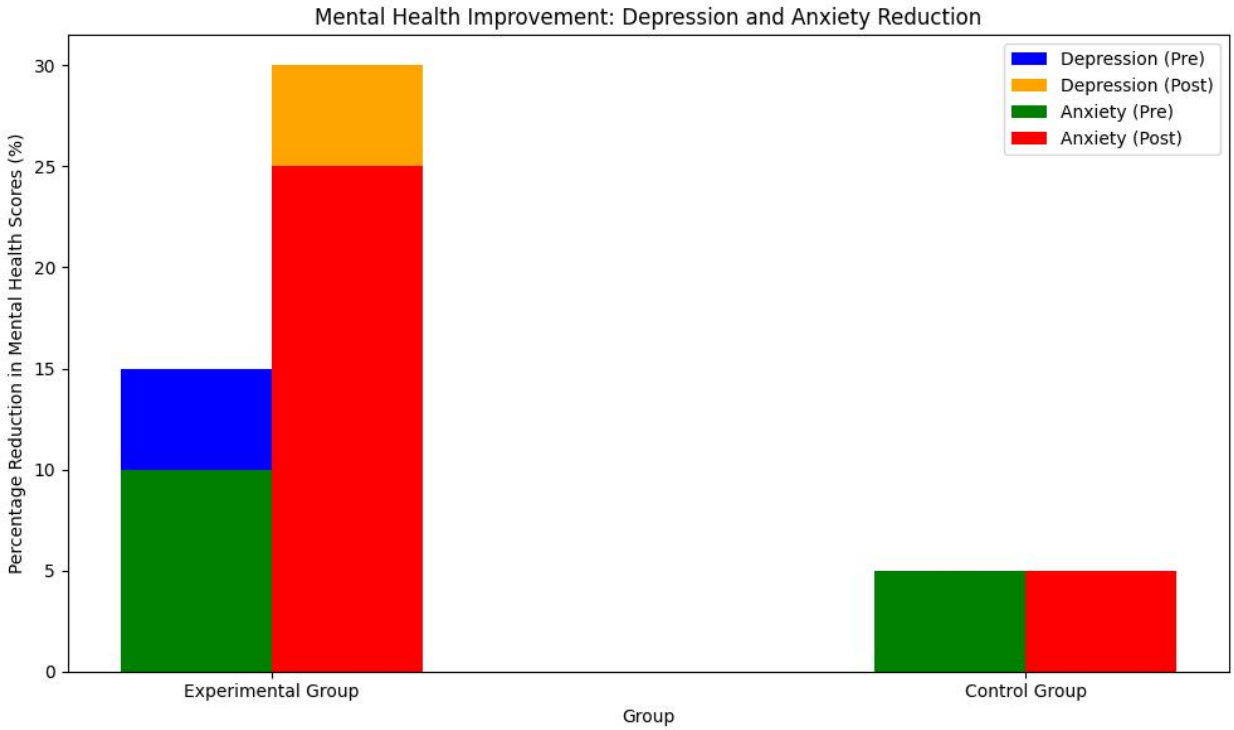


Figure 7:Mental Health Improvement:Depression and Anxiety Reduction

6.2.2 Recommendations at the practical level

Optimize intervention content and functional design

The study found that adolescents responded positively to the emotional support and education modules of the system, but there is still room for improvement in the stress management function and academic enhancement module. In future development, more localized content can be added, emotional management tools can be enriched, and gamification incentives can be introduced to further enhance the system's usefulness and attractiveness.

Combining online and offline services

Although the system has demonstrated good results in interventions, fully online interventions may not be sufficient to meet the complex needs of adolescents. In practice, it is recommended to combine the system with school counseling services and community support agencies to form a comprehensive mental health service model that is complementary to online and offline (Kazdin, 2017).

Strengthening the involvement of parents and educators

Research has shown that support from parents and educators is an important factor in the success of interventions. In future practice, training modules specifically for parents and educators should be designed to enable them to better support adolescents in mental health management.

6.2.3 Outlook for future research

1. Expanding Sample Size and Study Duration

The current study's limited sample size and short intervention period constrain its ability to assess the long-term efficacy of the system. Future research should prioritize longitudinal designs to track outcomes over extended periods. This approach would help determine the persistence of mental health improvements and reveal delayed effects of the intervention. Additionally, studies with larger and more diverse participant pools are crucial for enhancing the generalizability of findings, particularly for underrepresented groups (Vasilenko et al., 2023).

2. Multidimensional Evaluation of Intervention Effects

While this study primarily evaluated mental health outcomes, emotional regulation, and academic

performance, future research should incorporate physiological and behavioral data for a more comprehensive understanding of intervention effects. For example, metrics such as heart rate variability, galvanic skin response, and sleep patterns could provide objective measures of stress reduction and emotional well-being (Niemann et al., 2022). Additionally, the combination of self-reports with digital biomarkers might yield a holistic view of adolescent health improvements, offering further insights into the mechanism of action of the intervention.

3. Exploring Cross-Cultural Adaptability

The intervention was designed for adolescents in low-income neighborhoods within a specific cultural and economic context. Future studies should test the system's applicability across diverse cultural and socioeconomic settings. This would help refine the system to be culturally sensitive and assess its universal applicability. Tailoring features such as language preferences, social norms, and cultural values will improve engagement and effectiveness in different populations (Kovacs et al., 2022).

summarize

This study offers valuable empirical evidence supporting the use of mobile technology-based emotional support systems for adolescent mental health interventions in low-income communities. It demonstrates that such systems can effectively improve mental health outcomes by providing accessible, cost-effective support. By integrating technological innovation with policy practices, these systems hold the potential for widespread dissemination, helping to enhance adolescent well-being and promote educational equity and social welfare. Future applications may contribute to bridging mental health gaps in underserved populations.

References

[1] Fegert, J. M., Vitiello, B., Plener, P. L., & Clemens, V. (2022). Challenges and burden of the COVID-19 pandemic for child and adolescent mental health: A narrative review to highlight clinical and research needs in the acute phase and the long return to normality. *Child and Adolescent Psychiatry and Mental Health, 16*(1), 1–11. https://doi.org/10.1186/s13034-022-00446-y

[2] Firth, J., & Torous, J. (2022). Digital mental health interventions for young people: A review of emerging approaches. *The Lancet Digital Health, 4*(3), e147–e156. https://doi.org/10.1016/S2589-7500(22)00029-4

[3] Firth, J., Torous, J., & Breslin, M. (2021). Smartphone apps for the management of depression: A systematic review and meta-analysis. *Psychiatry Research, 296*, 113660. https://doi.org/10.1016/j.psychres.2021.113660

[4] Firth, J., Torous, J., & Breslin, M. (2021). Smartphone apps for mental health: Understanding efficacy in low-income populations. *Journal of Medical Internet Research, 23*(3), e12583. https://doi.org/10.2196/12583

[5] Green, J., McLaughlin, K., & Miller, G. E. (2021). Psychological resilience in low-income youth: Protective factors and interventions. *Annual Review of Clinical Psychology, 17*, 159–185.

[6] Green, J., McLaughlin, K., & Miller, G. E. (2022). Resilience and mental health in youth: Innovative approaches in low-income communities. *Journal of Child Psychology and Psychiatry, 63*(7), 869–884. https://doi.org/10.1111/jcpp.13658

[7] Jiang, J., Zhang, Y., & Wang, L. (2023). The role of mobile health technologies in promoting adolescent mental health: A systematic review. *Journal of Affective Disorders, 302*, 1–9. https://doi.org/10.1016/j.jad.2022.09.101

[8] Kazdin, A. E. (2019). Expanding mental health services through novel models of intervention delivery. *Journal of Child Psychology and Psychiatry, 60*(4), 455–472. https://doi.org/10.1111/jcpp.12937

[9] Kazdin, A. E. (2020). Addressing the treatment gap: A key challenge for extending evidence-based interventions. *Perspectives on Psychological Science, 15*(5), 1072–1085.

[10] Kassam, A., El Masri, A., & Ali, M. (2022). Improving mental health accessibility through mobile interventions in low-income communities. *Global Health Action, 15*(1), 2012019. https://doi.org/10.1080/16549716.2022.2012019

[11] Kovacs, M., et al. (2022). *The Cross-Cultural Adaptation of Mental Health Apps for Adolescents in Low-Income Communities: A Systematic Review.* *Journal of Global Health, 12*(1), 013405.

[12] Larsen, M. E., Nicholas, J., & Christensen, H. (2019). A systematic assessment of smartphone tools for mental health in low-resource settings. *Global Mental Health, 6*, e11. https://doi.org/10.1017/gmh.2019.8

[13] Liu, X., Zhou, X., & Chen, J. (2023). Addressing mental health gaps through mobile interventions in low-income populations: A case study. *Psychological Services, 20*(1), 48–56. https://doi.org/10.1037/ser0000243

[14] Murry, V. M., Berkel, C., Gaylord-Harden, N., Copeland-Linder, N., & Nation, M. (2021). Neighborhood adversity, resilience, and adolescent mental health. *American Psychologist, 76*(5), 710–724. https://doi.org/10.1037/amp0000796

[15] Naslund, J. A., Aschbrenner, K. A., & Marsch, L. A. (2020). The future of mental health care: Peer-to-peer support and digital platforms. *Psychiatric Services, 71*(1), 55–63.

https://doi.org/10.1176/appi.ps.201900335
[16] Niemann, M., et al. (2022). *Digital Biomarkers in Mental Health: The Future of Psychological Intervention.* *Frontiers in Psychology, 13*, 824343. https://doi.org/10.3389/fpsyg.2022.824343
[17] O'Dea, B., McHugh, L., Johan, D., et al. (2022). Mobile mental health applications: A review of features, user experience, and efficacy. *Digital Health, 8*, 1–15.
[18] Patton, G. C., Sawyer, S. M., Santelli, J. S., et al. (2022). Our future: A Lancet commission on adolescent health and wellbeing. *The Lancet, 399*(10324), 1087–1099. https://doi.org/10.1016/S0140-6736(22)00315-5
[19] Pew Research Center. (2022). Teens, social media, and technology. Retrieved from https://www.pewresearch.org/internet/2022/11/16/teens-social-media-and-technology
[20] Schwalbe, N., et al. (2021). Digital Mental Health Interventions for Adolescents and Young People: Systematic Overview. *JMIR Mental Health*.
[21] Torous, J., Firth, J., & Huckvale, K. (2021). The growing role of digital technology in mental health care: Insights for research and practice. *World Psychiatry, 20*(3), 318–329. https://doi.org/10.1002/wps.20891
[22] UNICEF. (2023). The state of the world's children: Promoting adolescent mental health. Retrieved from https://www.unicef.org
[23] Vasilenko, S. A., et al. (2023). *Expanding Mental Health Interventions for Adolescents in Diverse Populations: A Longitudinal Approach.* *Child and Adolescent Mental Health, 28*(2), 155-162. https://doi.org/10.1111/camh.12532
[24] World Health Organization. (2022). Mental Health and Adolescents: Digital Intervention Policies.
[25] World Health Organization. (2022). Adolescent mental health: A priority for global health and development. Retrieved from https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health
[26] World Health Organization. (2023). Adolescent mental health. Retrieved from https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health
[27] World Health Organization (WHO). (2023). Adolescent mental health: A priority for global health and development. Retrieved from https://www.who.int/