

Digital mental health education: the impact of e-book intervention on anxiety knowledge among adolescent girls

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ABSTRACT

Introduction: Adolescence is a critical developmental stage often accompanied by psychological challenges, with anxiety being one of the most prevalent mental health issues among young people. Limited awareness and ineffective learning strategies contribute to poor understanding of anxiety, particularly among adolescent girls. This study aimed to examine the effect of e-book media on improving knowledge about anxiety and mental health among adolescent girls.

Methods: A pre-experimental study with a one-group pretest–posttest design was conducted among 62 female students at Madrasah Aliyah Muhammadiyah Salaka, South Sulawesi, Indonesia. Data were collected using a validated questionnaire assessing knowledge of anxiety before and after the intervention. The educational e-book contained comprehensive information on the definition, causes, symptoms, prevention, and coping strategies related to anxiety. Data were analyzed using the Wilcoxon Signed Rank Test with SPSS version 29.0.

Results: Before the intervention, 54.8% of respondents demonstrated low knowledge, while 4.8% had high knowledge. After exposure to the e-book, 74.2% reached the high knowledge level, and none remained in the low category. Statistical analysis revealed a significant difference between the pretest and posttest results ($Z = -6.997$, $p < 0.0001$), confirming the effectiveness of e-book media in enhancing mental health knowledge.

Conclusion: E-book media proved to be an effective and innovative educational tool for improving adolescents' understanding of anxiety and mental health. Integrating digital learning materials into school-based programs can promote mental health literacy and support early prevention among youth populations.

Keywords: Adolescent girls, Anxiety disorders, Digital education, E-health, Mental health literacy.



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INTRODUCTION

Adolescence is a critical period of human development characterised by rapid biological, psychological, and social changes (Qu *et al.*, 2024). During this stage, adolescents are often confronted with various challenges that influence their mental health and overall well-being. The World Health Organization (WHO) estimates that one in seven adolescents worldwide experiences a mental health disorder, with anxiety being one of the most common conditions (Andrews *et al.*, 2025). Anxiety disorders can disrupt adolescents' daily functioning, including academic performance, interpersonal relationships, and self-esteem. In the Indonesian context, national health surveys have consistently reported an increasing prevalence of anxiety and other mental health issues among young people, highlighting the urgency of effective interventions to address this growing concern (Reinhart *et al.*, 2025).

The transitional nature of adolescence places individuals at greater risk of psychological vulnerability (Aghabozorgi *et al.*, 2024). Adolescents are expected to adapt to shifting roles and responsibilities, while simultaneously navigating pressures from academic demands, peer relationships, and family expectations (Limpanopparat, Gibson and Harris, 2024). Failure to cope with these pressures may result in persistent anxiety, which, if left unaddressed, could progress to more severe psychological disorders (McKellar *et al.*, 2024). This is particularly concerning for adolescent girls, who are reported to have higher rates of anxiety compared to their male counterparts due to biological, hormonal, and sociocultural factors. For this reason, adolescent girls are an essential target group for mental health education and intervention strategies (Szota *et al.*, 2025).

Education about mental health plays a central role in promoting awareness, shaping attitudes, and equipping adolescents with the knowledge necessary to recognize, manage, and seek help for anxiety-related issues (Ruiz-Ranz and Asín-Izquierdo, 2025). Traditional health education methods, such as lectures or printed materials, have often been criticized for their limited effectiveness in sustaining adolescent engagement. Adolescents today are digital natives who interact daily with technology in their learning and social environments (Okumu *et al.*, 2025). Therefore, integrating technology-based tools into mental health education may represent a promising and innovative approach. Among various digital learning resources, e-books have gained increasing attention as a medium of health education. E-books are digital versions of books that can be accessed through smartphones, tablets, or computers (Lin *et al.*, 2025). They offer several advantages over conventional print media, including portability, accessibility, interactive features, and the potential to integrate multimedia elements. For adolescents, the visual appeal and user-friendly format of e-books make them particularly attractive for learning. Additionally, e-books can be designed to provide concise yet comprehensive information, allowing users to revisit materials at any time and from anywhere. This flexibility supports self-paced learning, which highly benefits adolescents with diverse learning preferences (Ramos Miguel *et al.*, 2024).

The effectiveness of e-books in health education has been highlighted in several studies. Previous research indicates that e-books can significantly enhance adolescents' knowledge of health-related issues, including nutrition, reproductive health, and substance abuse prevention (Pennacchia *et al.*, 2025). Moreover, studies on mental health literacy suggest that digital interventions, such as mobile applications and e-books, are effective in improving awareness and reducing stigma associated with mental disorders. However, despite these findings, there remains a limited body of research exploring the specific role of e-books in promoting knowledge about mental health issues, particularly anxiety, among adolescent girls in Indonesia (Costa e Silva *et al.*, 2025). Anxiety among adolescent girls is often underrecognized and undertreated due to a

lack of awareness, cultural stigma, and insufficient access to mental health services. As central institutions in adolescent life, schools provide an excellent platform for implementing health education initiatives (Zhu, Wang and Hu, 2025). Integrating e-book media into school-based health education programs can improve knowledge, foster positive attitudes, and empower adolescent girls to take proactive steps toward managing their mental health. In particular, Madrasah Aliyah Muhammadiyah Salaka, a secondary school in Takalar Regency, provides a relevant context for this research. Students in this setting face academic pressures and developmental challenges that make them susceptible to anxiety. Introducing e-books as an educational medium could be an innovative strategy to bridge knowledge gaps and promote better mental health outcomes. The significance of this study lies in its contribution to mental health promotion among adolescents and its potential to inform educational practices and policies in Indonesia. By evaluating the impact of e-book media on knowledge levels, this research may provide evidence-based insights for teachers, healthcare providers, and policymakers seeking to strengthen adolescent mental health programs. Furthermore, it aligns with global efforts to integrate digital technology into health promotion, offering a scalable and sustainable approach for reaching young populations.

Adolescence is a formative period during which mental health challenges, particularly anxiety, are prevalent and consequential. E-books represent a promising educational tool that aligns with adolescents' digital lifestyles and can enhance their understanding of mental health. This study focuses on assessing the effect of e-book media on adolescent girls' knowledge about anxiety-related mental health issues in Madrasah Aliyah Muhammadiyah Salaka, Takalar Regency. The objective of this study is to analyze the effect of e-book media on the level of knowledge about mental health issues (specifically anxiety) among adolescent girls.

RESEARCH METHODOLOGY

Research Design

This study employed a quasi-experimental design with a one-group pre-test and post-test approach. The design was chosen to measure the effect of e-book media intervention on the knowledge of adolescent girls regarding mental health issues, particularly anxiety. The respondents' knowledge was assessed before and after the intervention to identify any significant differences.

Research Location and Time

The research was conducted at Madrasah Aliyah Muhammadiyah Salaka, Takalar Regency, South Sulawesi, Indonesia, in 2025.

Population and Sample

The population consisted of all female students at Madrasah Aliyah Muhammadiyah Salaka. A total of 62 respondents were selected as the research sample using a non-probability sampling technique with accidental sampling. The inclusion criteria were adolescent girls willing to participate and present during the research period, while those absent or who declined participation were excluded.

Intervention

The intervention involved the distribution and use of an educational e-book designed to provide comprehensive knowledge regarding mental health issues, with a specific focus on anxiety. The e-book contained definitions, causes, symptoms, prevention, and coping strategies related to anxiety disorders in adolescents. Respondents were required to read and engage with the e-book as part of the intervention.

Data Collection Technique

Data were collected through a structured questionnaire administered in two stages: a Pre-test conducted before the distribution of the e-book to assess baseline knowledge. Post-tests were conducted after the intervention to evaluate changes in respondents' knowledge.

Research Instrument

The instrument was a validated knowledge questionnaire consisting of multiple-choice and structured questions that covered key aspects of mental health and anxiety. The instrument had undergone validity and reliability testing to ensure accuracy and consistency.

Data Analysis

Data were processed using SPSS version 29.0 for Windows. The analysis consisted of a Univariate analysis to describe respondents' demographic characteristics and knowledge levels and a bivariate analysis to test the difference between pre-test and post-test knowledge scores. If the data were normally distributed, a Paired Sample T-test was applied. The Wilcoxon Signed-Rank Test was used if the data were not normally distributed.

Ethical Considerations

This study adhered to the principles of ethical research, including obtaining informed consent, maintaining the confidentiality of respondents' identities, and ensuring voluntary participation. Respondents were informed about the study's purpose and assured that their responses would remain anonymous and be used solely for academic purposes.

RESULT

Table 1. Distribution of Respondents by Age, Class

Age (years)	Frequency	Percentage (%)
14	2	3.2
15	15	24.2
16	19	30.6
17	20	32.3
18	5	8.1
19	1	1.6
Class		
X	14	22.6
XI	23	37.1
XII	25	40.3

Most respondents were aged 17 (32.3%), followed by those aged 16 (30.6%). This indicates that the majority of participants were in mid-adolescence, a period where awareness of mental health issues becomes increasingly important. Most respondents came from Class XII (40.3%), followed by Class XI (37.1%). This shows that most participants were in the final stage of their secondary education.

Table 2. Knowledge level of respondents before and after the e-book intervention

Knowledge Level	Pre-test (f / %)	Post-test (f / %)
Poor	34 (54.8%)	0 (0.0%)
Fair	25 (40.3%)	16 (25.8%)
Good	3 (4.8%)	46 (74.2%)

Before the intervention, more than half of the respondents (54.8%) demonstrated poor knowledge, and only 4.8% reached a reasonable level. After the e-book intervention, none of the respondents remained in the poor category; instead, 74.2% shifted into the good knowledge level. This indicates that the e-book media was highly effective in improving respondents' knowledge of mental health issues.

Table 3. Effect of e-book media on knowledge (Wilcoxon signed rank test)

Test	Z-value	p-value	Interpretation
Pre-test vs. Post-test	-6.997	0.000	Significant

The Wilcoxon Signed Rank Test revealed a $p\text{-value} = 0.000 < 0.05$, indicating a statistically significant improvement in knowledge after using the e-book. This confirms that the intervention had a positive effect on adolescent girls' understanding of mental health issues.

The bivariate analysis using the Wilcoxon Signed Rank Test showed a statistically significant difference in respondents' knowledge before and after the e-book intervention ($Z = -6.997$; $p = 0.000 < 0.05$). This finding indicates that the e-book media intervention had a measurable and positive effect on the knowledge level of adolescent girls regarding mental health issues, particularly anxiety. Specifically, before the intervention, more than half of the respondents (54.8%) were in the poor knowledge category, while only 4.8% reached the good category. After the intervention, none of the respondents remained in the poor category, and the majority (74.2%) shifted into the good knowledge category. Thus, it can be concluded that the use of e-book media is effective in significantly improving knowledge about mental health (anxiety) among adolescent girls.

DISCUSSION

The findings of this study demonstrated that the use of e-book media had a statistically significant effect on the improvement of adolescent girls' knowledge regarding mental health issues, particularly anxiety. The Wilcoxon test yielded a $p\text{-value}$ of 0.000, which is less than the significance threshold of $\alpha = 0.05$, confirming the effectiveness of e-books as a health education tool. This section discusses these results in light of previous studies, theoretical frameworks, and practical implications.

E-Book Media as an Effective Educational Tool

E-books offer several advantages as an educational medium for adolescents. Their accessibility, interactive design, and ability to present information in a concise and visually appealing manner make them attractive to younger audiences (Jin *et al.*, 2025). Adolescents are often referred to as digital natives, frequently using smartphones and other gadgets; therefore, e-books naturally fit into their learning habits. The increased knowledge observed in this study aligns with earlier findings by Pineault *et al.* (2025), who reported that e-book-based literacy interventions significantly improved adolescents' mental health knowledge. Similarly, Manning (2024) emphasised that e-books effectively promote positive health attitudes and behaviours because they are accessible and engaging (Danese *et al.*, 2025). The effectiveness of e-books can also be explained through Mayer's Cognitive Theory of Multimedia Learning, which suggests that learners understand and retain information more effectively when it is presented in both visual and verbal formats. E-books, which combine text, images, and sometimes interactive features, utilize this dual-channel processing, enhancing comprehension and memory (Crane *et al.*, 2025).

Adolescence is a developmental stage characterised by emotional volatility, identity formation, and heightened vulnerability to stress and anxiety (Lisa De Panfilis *et al.*, 2025). The challenges of peer acceptance, academic pressure, and family expectations often contribute to mental health problems, particularly anxiety disorders. This study's findings are crucial, as increased knowledge about anxiety can empower adolescents to recognize symptoms, reduce stigma, and adopt healthy coping strategies (Wang and Havewala, 2025). Adolescents are more likely to seek help, engage in self-care practices, and avoid maladaptive coping mechanisms when informed. The results also correspond with Maslow's hierarchy of needs, where safety and psychological well-being are fundamental for achieving higher-order goals such as self-esteem

and self-actualisation. By improving knowledge, e-book interventions address adolescents' need for security and understanding, fostering resilience and growth (Yılmaz, Yılmaz-Özdemir and Woodhead, 2025).

The results of this study are consistent with earlier interventions using various media formats. For instance, Stewart *et al.* (2025) found that mental health counselling sessions significantly improved adolescents' knowledge and attitudes. Likewise, audiovisual media interventions demonstrated a 42% increase in knowledge among participants (Zeiler *et al.*, 2025). These findings collectively highlight that media-based health education, whether audiovisual or digital, provides effective alternatives to traditional classroom lectures (McLane *et al.*, 2024). However, this study uniquely emphasises the specific impact of e-books, which combine the advantages of portability, accessibility, and self-paced learning (Putri, Bachtiar and Suprpto, 2025). Unlike audiovisual interventions, which may require more resources and infrastructure, e-books can be easily distributed and accessed through common devices such as smartphones. This makes them especially relevant in resource-limited settings (Tahir and Arniyanti, 2023).

The implications of these findings are significant for health promotion and school-based education. First, teachers and health workers should consider integrating e-books into their educational strategies, especially when addressing sensitive topics such as mental health. E-books allow adolescents to engage with the material privately, which may reduce embarrassment or stigma. Second, policymakers can incorporate e-book-based curricula as part of broader national strategies to address adolescent mental health, particularly given the high prevalence of anxiety and depression among Indonesian youth. Third, parents can also be involved by encouraging their children to utilize e-books as supplemental resources for mental health awareness. Despite the positive results, this study has some limitations. The quasi-experimental design, with a single group and pre-test/post-test evaluation, may not fully control for external influences on participants' knowledge gain. Additionally, the study focused solely on adolescent girls in a single school, thereby limiting the generalizability of the findings.

Future research should employ larger sample sizes, include male adolescents, and apply randomized controlled designs to strengthen the evidence base. Moreover, longitudinal studies are needed to determine whether knowledge improvements translate into long-term behavioral changes and better mental health outcomes. This study confirms that e-book media significantly enhance adolescent girls' knowledge about anxiety and mental health. These findings support the growing literature advocating innovative, technology-based health education approaches. By leveraging digital media that resonates with adolescents' lifestyles, educators and health professionals can foster greater awareness, reduce stigma, and support the development of healthier generations.

CONCLUSION

This study demonstrated that e-book media significantly improved adolescent girls' knowledge about anxiety and mental health. The digital learning format proved effective in increasing awareness and understanding, offering an accessible and engaging approach that aligns with adolescents' technological habits. E-books can serve as a practical educational tool for promoting mental health literacy among school-aged populations, particularly in resource-limited settings.

It is recommended that schools and health educators integrate e-book-based materials into mental health education programs to enhance student engagement and comprehension. Future studies should involve larger and more diverse populations, include male adolescents, and

examine the long-term effects of e-book interventions on behavioral changes and mental health outcomes.

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Conflict of Interest

There are no potential conflicts of interest relevant to this article.

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