

The Effectiveness of Digital Media-Based Mental Health Education in Enhancing Adolescents' Resilience to Academic Stress

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ABSTRACT

Background: Continuous academic demands may place adolescents under psychological strain and can interfere with emotional well-being, learning, and the ability to recover from setbacks. Because digital media are already embedded in students' daily routines, they may offer a practical channel for school-based mental health education. Purpose: This study evaluated the effect of a digital media-based mental health education program on resilience in adolescents experiencing academic stress. Methods: A quasi-experimental pretest-posttest study with a control group was conducted among 120 senior high school students aged 15-18 years. Sixty students received a six-week digital program consisting of interactive videos, infographics, podcasts, reflective activities, stress-management practice, online discussion, and quizzes, while 60 students received conventional health education. Outcomes were measured with the Connor-Davidson Resilience Scale (CD-RISC-10), Academic Stress Scale (ASS), and Mental Health Literacy Questionnaire (MHLq). Paired and independent t-tests, ANCOVA, and Cohen's d were used in the analysis. Results: After the intervention, the digital group demonstrated higher resilience and mental health literacy and lower academic stress than the control group (all $p < .001$). The effect on resilience was large (Cohen's $d = 0.82$). Implications: Integrating structured digital mental health learning into school health activities may give students flexible access to coping and mental health resources. Conclusion: In this sample, a six-week digital education program was associated with stronger resilience, better mental health literacy, and reduced academic stress.

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INTRODUCTION

Academic pressure is part of everyday secondary-school life, but its effect depends on intensity and duration. When demands remain high for long periods, students may experience anxiety, depressive symptoms, emotional exhaustion, disturbed sleep, poorer academic performance, and lower quality of life. Evidence linking school pressure with adolescent mental-health difficulties supports the need for preventive action within school health programs (Stearse et al., 2023; World Health Organization, 2025).

At the same time, adolescents now learn in an environment where digital technology is closely intertwined with schoolwork. Online platforms can improve access and flexibility, yet prolonged screen exposure, constant connectivity, information overload, and social comparison may create additional strain. This same digital familiarity also creates an opportunity: mental-health content can be delivered through media that students already use. Reviews suggest that digital approaches are most useful when the material is evidence-based, engaging, and supported by appropriate guidance (Lehtimäki et al., 2021; Wright et al., 2023).

For the present study, resilience was treated as a capacity for adaptive recovery rather than simply the absence of distress. A resilient student can regain psychological balance after difficult experiences, respond to pressure in a constructive way, and continue functioning despite academic challenges. Research has shown that resilience is related to better school adjustment when academic stress is present, indicating that it is a meaningful target for school-based intervention (Choi et al., 2023).

Digital delivery may be especially relevant when students need coping support outside formal counseling hours. In one randomized study, adolescents who used a self-guided digital mental-health program reported reductions in perceived stress, rumination, and loneliness across 12 weeks (Mochrie et al., 2024). More recently, Lehner et al. (2026) evaluated an internet-based school program that combined stress-management content with mental-health literacy. Together, these studies illustrate how web-based learning can place psychoeducation and coping practice within the broader educational environment.

Traditional mental-health education in schools is often provided through lectures, seminars, counseling sessions, or printed handouts. These formats remain valuable, but their reach can be constrained by scheduling, continuity, accessibility, and differences in student participation. Digital resources can extend rather than replace these approaches by allowing students to revisit materials and interact with content over time. Evidence nevertheless indicates that sustained engagement and some form of human support are important for effective implementation (Garrido et al., 2019; Hollis et al., 2017; Wright et al., 2023).

A digital mental-health curriculum can combine several learning formats instead of relying on one-way information transfer. Short videos, infographics, podcasts, quizzes, reflective tasks, and moderated discussion can be used to build knowledge of mental health, recognition of emotional problems, stress-management skills, and adaptive coping. Previous reviews and school studies report favorable effects on knowledge and related protective outcomes, although results differ

according to program structure, adherence, and the level of guidance provided (Lehtimaki et al., 2021; O'Dea et al., 2021; Wright et al., 2023).

Despite rapid growth in this field, the available evidence is not uniform. Many digital interventions focus primarily on anxiety or depression, while resilience in relation to academic stress receives less attention. Studies also vary in delivery format, professional involvement, participant adherence, follow-up length, and methodological quality. In addition, evidence from lower-resource or developing-country school settings remains less extensive (Hollis et al., 2017; Lehtimaki et al., 2021; Wright et al., 2023). A program that examines resilience, academic stress, and mental-health literacy within the same evaluation can therefore address an important gap.

The intervention evaluated in this study was constructed around that gap. Rather than presenting mental-health information as a single lesson, the program distributed the content across six weeks and used multiple digital formats: brief educational videos, interactive infographics, podcasts, guided reflection, stress-management practice, quizzes, and moderated discussion. Repeated exposure was intended to help students connect information with practical coping responses during periods of academic pressure.

The study adds evidence in three ways. It places resilience at the center of the evaluation, combines several digital learning modalities within one school-health intervention, and examines the program among senior high school students in a developing-country context. The inclusion of mental-health literacy and academic stress alongside resilience also permits a broader assessment of how students respond to the intervention.

These features give the study both practical and conceptual relevance. At a conceptual level, the analysis explores whether changes in resilience, mental-health literacy, and academic stress occur together after a structured digital intervention. From an applied perspective, the findings may assist teachers, counselors, health professionals, and policy planners who are considering digital components for school mental-health promotion.

The study therefore aimed to determine whether digital media-based mental health education was associated with improved resilience to academic stress among high school students. It was hypothesized that, after the intervention, students in the digital education group would have higher resilience and mental-health literacy scores and lower academic-stress scores than students who received conventional health education.

METHODS

1. Study Design

A quasi-experimental pretest-posttest control-group design was used. Outcomes related to resilience, academic stress, and mental-health literacy were compared between students who received the digital mental-health education program and students who received conventional health education.



2. Study Setting and Participants

Data collection was carried out from January to March 2026 in three public senior high schools located in Padang, Indonesia. The eligible population consisted of students enrolled in grades 10 and 11 at the participating schools.

The final sample comprised 120 students. Sixty were allocated to the intervention arm and 60 to the control arm. Participants were selected through a multistage cluster procedure, followed by proportional random sampling within each participating school.

Eligibility requirements were applied in the same manner to both study arms. Students could participate when they were 15-18 years old, actively enrolled in grade 10 or 11, able to access the internet through a smartphone or another digital device, and willing to join the study. Written consent was obtained from the student and from a parent or legal guardian. Allocation to the study arm occurred after eligible participants had been selected.

The experimental condition was a six-week Digital Media-Based Mental Health Education Program delivered through an online learning environment that students could access using a smartphone or computer.

3. Intervention

Participants in the intervention arm followed the Digital Media-Based Mental Health Education Program for six consecutive weeks. The material was accessed through an online learning platform using either a smartphone or computer, and one learning module was scheduled for completion each week.

Every module contained a 10-15 minute interactive educational video, an animated infographic, a podcast, a digital self-reflection task, a stress-management or mindfulness exercise, a moderated online discussion, and a feedback-based quiz. Across the entire intervention, each participant therefore completed six of each component. A weekly module required approximately 60 minutes, and the activities were designed as integrated elements of the same module rather than as separate interventions.

Students assigned to the comparison arm continued with conventional school health education for the same six-week period, receiving one session each week. Content addressed the same principal themes--adolescent mental health, academic stress, coping, and help-seeking--but delivery relied on classroom teaching and printed materials and did not use the digital videos, infographics, podcasts, online discussions, reflective tasks, or online quizzes provided to the intervention group.

4. Research Instruments

Study outcomes were measured with three standardized instruments.

a. Connor–Davidson Resilience Scale (CD-RISC-10)

Resilience was measured using the 10-item Connor-Davidson Resilience Scale (CD-RISC-10), a validated single-factor resilience measure (Campbell-Sills & Stein, 2007). Responses are scored

from 0 to 4 across ten items, producing a possible total of 0-40; higher totals indicate greater resilience.

b. Academic Stress Scale (ASS)

Academic stress was captured with a 20-item instrument covering academic workload, examination demands, learning difficulties, parental expectations, and time-management pressures. Responses were recorded on a five-point Likert scale, and higher total scores represented greater academic stress.

c. Mental Health Literacy Questionnaire (MHLq)

Mental-health literacy was evaluated with the Mental Health Literacy Questionnaire (MHLq). The instrument addresses knowledge and beliefs about mental health, recognition of psychological problems, help-seeking, and attitudes toward well-being. Previous validation research has reported acceptable psychometric performance for the MHLq (Dias et al., 2018); higher scores indicate better mental-health literacy.

Before the main study, all instruments were adapted into Indonesian using forward and backward translation to preserve conceptual meaning. The translated versions were reviewed for clarity and cultural suitability and then pilot-tested with 30 students. Internal consistency was satisfactory, with Cronbach's alpha values of 0.91 for CD-RISC-10, 0.89 for ASS, and 0.93 for MHLq, supporting their use in the study population.

d. Data Collection Procedure

Baseline measurements were completed before either study condition began. After six weeks, participants completed the same instruments again as the posttest. Intervention adherence was reviewed each week using attendance, digital-module completion, participation in online discussion, and quiz records. Students who completed less than 80% of intervention activities were excluded from the final analysis.

e. Outcome Measures

The principal outcome was the difference in CD-RISC-10 resilience score between pretest and posttest.

Additional outcomes were defined as follows:

- 1) Change in academic-stress score from baseline to posttest.
- 2) Change in mental-health literacy from baseline to posttest.
- 3) Differences between study groups in post-intervention outcomes after adjustment for baseline values.

f. Statistical Analysis

IBM SPSS Statistics was used for all analyses. Descriptive statistics were first calculated for participant characteristics and study variables. Continuous variables were summarized as means with standard deviations, whereas categorical data were presented as frequencies and percentages. Distributional assumptions were assessed using the Shapiro-Wilk test for normality and Levene's test for equality of variances.

Within-group pretest-posttest changes were examined with paired-samples t-tests, while independent-samples t-tests were applied to comparisons between groups. ANCOVA was



subsequently used to estimate group effects while controlling for baseline scores; posttest measures served as dependent variables and the corresponding baseline scores were entered as covariates.

The magnitude of the intervention effect was summarized with Cohen's *d*. Effect sizes of approximately 0.20, 0.50, and 0.80 were interpreted as small, medium, and large, respectively. Statistical testing used a two-sided significance threshold of $p < 0.05$ with 95% confidence intervals.

5. Ethical Considerations

Ethical approval was obtained from the Health Research Ethics Committee of the participating institution (Approval No. KEPK/015/2026). Written informed consent was secured from participating students and from their parents or legal guardians. Participation was voluntary, confidentiality was maintained, and students were informed that withdrawal was permitted at any time without academic penalty.

RESULTS

1. Participants' Characteristics

All 120 enrolled students completed both measurements, resulting in a 100% response rate. The intervention and control groups each contained 60 participants. No statistically significant baseline demographic differences were identified between the two groups (all $p > .05$), indicating that their initial characteristics were comparable.

Table 1. Baseline Characteristics of Participants (N = 120)

Characteristics	Intervention (n=60)	Control (n=60)	p-value
Age (Mean $\pm$ SD)	16.41 $\pm$ 0.82	16.37 $\pm$ 0.79	0.781
Male, n (%)	26 (43.3)	24 (40.0)	0.713
Female, n (%)	34 (56.7)	36 (60.0)	
Grade X, n (%)	31 (51.7)	29 (48.3)	0.705
Grade XI, n (%)	29 (48.3)	31 (51.7)	
Daily Smartphone Use (>4 h), n (%)	39 (65.0)	37 (61.7)	0.702

Overall, the baseline profiles of the two groups were similar, providing an appropriate basis for evaluating differences observed after the intervention.

2. Changes in Resilience Scores

Resilience increased in both study arms between pretest and posttest, although the improvement was substantially larger among students who received the digital program.

Table 2. Comparison of Resilience Scores Before and After the Intervention

Group	Pretest Mean $\pm$ SD	Posttest Mean $\pm$ SD	Mean Difference	p-value
Intervention	24.82 $\pm$ 4.61	33.76 $\pm$ 3.98	+8.94	<0.001
Control	25.14 $\pm$ 4.53	27.18 $\pm$ 4.35	+2.04	0.031

Paired analysis showed a significant increase in resilience within the intervention group ($p < .001$). Resilience also increased in the control group, but the change was considerably smaller despite reaching statistical significance.

3. Changes in Academic Stress

Students who participated in the digital mental-health program showed a marked decline in academic stress from baseline to posttest.

Table 3. Comparison of Academic Stress Scores

Group	Pretest Mean $\pm$ SD	Posttest Mean $\pm$ SD	Mean Difference	p-value
Intervention	71.56 $\pm$ 8.42	56.24 $\pm$ 7.31	-15.32	<0.001
Control	70.81 $\pm$ 8.27	67.53 $\pm$ 7.98	-3.28	0.047

Over the six-week period, the decrease in academic-stress scores was significantly larger for the intervention group than for students receiving conventional education.

4. Changes in Mental Health Literacy

Mental-health literacy increased notably after exposure to the digital education program.

Table 4. Comparison of Mental Health Literacy Scores

Group	Pretest Mean $\pm$ SD	Posttest Mean $\pm$ SD	Mean Difference	p-value
Intervention	61.47 $\pm$ 6.25	81.38 $\pm$ 5.82	+19.91	<0.001
Control	62.18 $\pm$ 6.41	66.42 $\pm$ 6.08	+4.24	0.039

Compared with conventional health education, the digital intervention was associated with a much greater improvement in knowledge and understanding related to mental health and adaptive coping.

5. Between-Group Comparison After Intervention

Independent-samples t-tests of the posttest scores identified statistically significant differences between the intervention and control groups for all three outcomes.

Table 5. Comparison of Posttest Outcomes Between Groups

Outcome Variable	Intervention Mean $\pm$ SD	Control Mean $\pm$ SD	Mean Difference	p-value
Resilience	33.76 $\pm$ 3.98	27.18 $\pm$ 4.35	6.58	<0.001
Academic Stress	56.24 $\pm$ 7.31	67.53 $\pm$ 7.98	-11.29	<0.001
Mental Health Literacy	81.38 $\pm$ 5.82	66.42 $\pm$ 6.08	14.96	<0.001

At the end of the program, students in the intervention arm had greater resilience and mental-health literacy and reported less academic stress than those in the control arm.



6. ANCOVA Analysis

ANCOVA was performed to examine intervention effects after taking baseline outcome scores into account.

Table 6. ANCOVA Results

Outcome Variable	F	p-value	Partial η^2
Resilience	34.87	<0.001	0.229
Academic Stress	28.14	<0.001	0.194
Mental Health Literacy	39.62	<0.001	0.253

Controlling for baseline measurements did not eliminate the group differences. Assignment to the intervention or control condition remained significantly related to resilience, academic stress, and mental-health literacy (all $p < .001$), and the partial eta-squared values were in the moderate-to-large range.

7. Effect Size

Cohen's d was calculated to express the practical size of the differences associated with the intervention.

Table 7. Effect Size of the Intervention

Outcome	Cohen's d	Interpretation
Resilience	0.82	Large
Academic Stress	0.79	Moderate–Large
Mental Health Literacy	0.91	Large

Effect-size estimates were large for resilience and mental-health literacy and moderate-to-large for the reduction in academic stress.

Taken as a whole, the findings indicate that participation in the six-week digital mental-health education program was associated with stronger resilience, improved mental-health literacy, and a greater reduction in academic stress than conventional school health education.

DISCUSSION

The present study evaluated a six-week digital mental-health education program as a school-based strategy for strengthening resilience under academic pressure. Students exposed to the digital intervention improved more than the control group in resilience and mental-health literacy and experienced a larger reduction in academic stress. This overall pattern is in line with reviews showing that appropriately designed digital interventions can support adolescent mental-health promotion, particularly when they include interactive elements and some form of guidance (Lehtimäki et al., 2021; Wright et al., 2023).

The strongest improvement was observed for resilience. This construct reflects the capacity to adapt when facing stress and to maintain functioning despite challenging circumstances. Previous work suggests that resilience may weaken the adverse relationship between academic stress and school adjustment (Choi et al., 2023). Within the present program, reflection exercises, interactive

learning materials, and guided discussion may have helped students recognize stressors, regulate emotional reactions, build confidence in their coping ability, and choose more constructive responses to academic difficulties.

The resilience findings also fit the broader literature on technology-assisted psychological support. Digital programs allow psychoeducational and coping resources to be revisited repeatedly, and interactive features may encourage students to remain involved with the material. Reviews have generally reported better outcomes when digital interventions provide supervision, active engagement, or human interaction instead of operating entirely as unguided self-help (Garrido et al., 2019; Lehtimäki et al., 2021; Wright et al., 2023).

Academic stress was another outcome that changed meaningfully. Students in the intervention arm reported a substantially greater reduction than those who received conventional education. Academic pressure is linked with multiple psychological difficulties in adolescence, and targeted school-based programs can reduce stress when their content and delivery are appropriate (Stearns et al., 2023; van Loon et al., 2020). One possible explanation is that better mental-health knowledge and stronger resilience allowed participants to appraise school demands as more manageable, consistent with evidence that resilience can buffer the effect of academic stress on school adjustment (Choi et al., 2023). The mindfulness, relaxation, and cognitive coping activities included in the intervention may also have contributed to the decline in stress scores.

A substantial improvement was also found in mental-health literacy. Beyond factual knowledge, mental-health literacy involves recognizing psychological difficulties, understanding relevant risks and protective factors, knowing appropriate coping options, and identifying when professional help may be needed. Reviews of adolescent psychoeducational interventions indicate that interactive and multimedia approaches can improve these competencies (Seedakoti et al., 2020; Yani et al., 2025). Better literacy may support resilience by helping students interpret emotional experiences more accurately, respond with adaptive coping strategies, and seek assistance before problems become more severe.

The effect-size findings suggest that the observed changes were not only statistically detectable but also meaningful in practical terms. Large effects were found for resilience and mental-health literacy, supporting the potential value of digital education as one component of a broader school mental-health strategy. Digital delivery also makes it possible to combine videos, podcasts, infographics, quizzes, and discussion in formats that students can access across different times and locations. Nevertheless, the literature emphasizes that outcomes depend on program quality, engagement, and the availability of suitable support (Hollis et al., 2017; Wright et al., 2023).

An additional contribution of this study is its focus on resilience as an outcome in its own right rather than assessing only reductions in distress. Anxiety, depression, and emotional symptoms remain important, but resilience captures a broader capacity to cope with future challenges. Evidence that resilient students show better adjustment when academic stress is present supports the value of developing transferable coping resources through school-based interventions (Choi et al., 2023).



The findings have implications for both educational practice and public-health planning. Schools are increasingly required to support psychological well-being while pursuing academic goals. Digital mental-health education could complement existing student services, provided that programs are linked to school support systems, include appropriate guidance, and create clear pathways for help-seeking (O'Dea et al., 2021; Wright et al., 2023; Yani et al., 2025). Implementation would benefit from collaboration among teachers, counselors, psychologists, parents, and health professionals, as well as equitable access to reliable digital resources.

Several limitations affect interpretation of the results. Because the study used a quasi-experimental design without individual randomization, causal conclusions should remain cautious even though baseline characteristics were comparable. The sample was drawn from public high schools in a single geographic area, which may limit generalizability. All principal outcomes were self-reported and may therefore be influenced by recall or social-desirability bias. Finally, follow-up ended after six weeks, so the persistence of the observed improvements could not be determined. Similar concerns about short follow-up, heterogeneous methods, self-report measures, and engagement have been reported in reviews of digital mental-health interventions for young people (Hollis et al., 2017; Lehtimäki et al., 2021).

Future studies should test these findings in multicenter randomized controlled trials involving larger and more heterogeneous student populations and longer follow-up. Research should also determine which digital components contribute most to outcomes, examine adherence and implementation fidelity, and compare different levels of peer or professional guidance. As the field develops, mobile applications, gamified learning, artificial-intelligence-supported services, and immersive technologies warrant evaluation for effectiveness, safety, accessibility, and user engagement (Hollis et al., 2017; Lehtimäki et al., 2021; Wright et al., 2023).

Overall, the study suggests that digital media-based mental health education can be a useful addition to efforts aimed at helping adolescents cope with academic pressure. The simultaneous improvement in resilience and mental-health literacy, together with lower stress, indicates that structured digital learning may contribute to a more supportive school environment and to ongoing adolescent mental-health promotion.

CONCLUSIONS

In this quasi-experimental study, students who completed a six-week digital media-based mental-health education program showed stronger resilience and mental-health literacy and lower academic stress than students who received conventional health education. The intervention combined videos, podcasts, infographics, reflection activities, stress-management practice, and moderated discussion within a single structured learning program.

The findings strengthen the case for using digital technology as part of school-based mental-health promotion. Addressing resilience and mental-health literacy together may provide adolescents with practical resources for responding to academic demands, while digital delivery offers flexibility across different educational settings without requiring extensive additional infrastructure.

Schools and health professionals may consider incorporating carefully designed digital mental-health education into routine student health activities. Effective implementation should support coping and emotional adaptation while maintaining links with teachers, counselors, and other sources of help when students need further assistance.

Further research should determine whether these benefits persist over longer periods using randomized designs, larger samples, and more diverse school settings. Emerging approaches such as mobile mental-health applications, gamified learning, and artificial-intelligence-supported tools should also be evaluated for their potential contribution to adolescent resilience and mental well-being.

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