

Original Article

Effectiveness Of Animation-Based Psychoeducation On Adolescent Mental Health And Risk Behavior: A Quasi-Experimental Study



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ABSTRACT

Background: Adolescent mental health and risky behaviors, including the KRR TRIAD (Risky Sexual Behavior, Drug Abuse, and HIV/AIDS), remain significant public health challenges in Indonesia that contribute to school dropout rates. This study aimed to evaluate the effectiveness of PENA (Education and Animation)-based psychoeducation in improving knowledge and behavior related to mental health, TRIAD KRR, and dropout prevention.

Methods: This quasi-experimental study with a pretest-posttest control group followed the TREND (Transparent Reporting of Evaluations with Nonrandomized Designs) reporting guideline. A sample of 124 students was selected using a simple random sampling technique. The intervention group received PENA-based psychoeducation for a duration of 4 weeks (two sessions per week), while the control group received leaflets. Data were collected using a questionnaire that had been tested for validity and reliability. Data were analyzed using the Mann-Whitney test.

Results: The intervention group showed a significant increase in knowledge (Median 80, IQR: 75–85) compared to the control group (Median 45, IQR: 40–50) with $p = 0.015$. Furthermore, the intervention group demonstrated better behavior in preventing TRIAD KRR and school dropout with $p < 0.001$.

Conclusion: PENA-based psychoeducation is more effective than traditional leaflets in improving knowledge and fostering positive behavioral changes among adolescents

Keywords: Adolescent; Mental Health; Psychoeducation; Animation; Risk Behavior; School Dropouts.

Implications for Practice:

- The effectiveness of the PENA-based intervention indicates that psychoeducation for adolescents should increasingly utilize animated and interactive multimedia platforms to enhance mental health literacy and reduce stigma related to seeking emotional support.
- Behavioral change interventions addressing TRIAD KRR should incorporate emotionally engaging and socially modeled scenarios within psychoeducational programs to

Implications for Practice:

strengthen adolescents' decision-making capacity and resilience against risky behaviors.

- In resource-constrained contexts commonly found in low- and middle-income countries, digitally distributed animated psychoeducation modules offer a scalable and cost-effective strategy to expand adolescent mental health education through schools and community-based programs.

Introduction

Teenagers are a vital asset for the nation's future. Adolescence is a vulnerable period as they experience rapid physical, emotional, and social changes. Academic pressure, social demands, and the increasing influence of technology are triggers for mental health disorders in adolescents. Many teenagers do not yet understand the importance of maintaining mental health and are hampered by the stigma that still sticks in society. Poor mental health in adolescents can contribute to a variety of serious problems, including the KRR TRIAD (risky sexuality, drugs, and HIV/AIDS) and increased school dropout rates.

Ministry of Health data shows that mental health issues among adolescents in Indonesia continue to increase. Furthermore, the National Population and Family Planning Agency (BKKBN) has taken notes on a surge in risky behavior among adolescents, such as promiscuity and drug abuse, which are part of the KRR TRIAD. (Nasional, 2021) On the other hand, the school dropout rate remains a serious problem in Indonesian education. In the 2022/2023 academic year, the number of high school (SMA/SMK) dropouts was recorded at 22,495 students. (Indonesia, n.d.)

The lack of innovative media in Indonesia, where traditional health education often relies on passive leaflets, creates a lack of engagement among digital-native adolescents. Given that 34.9% of Indonesian adolescents experience mental health disorders, a more visually stimulating and interactive approach is urgently needed to bridge the gap between information and actual behavioral change. Therefore, this study aims to fill this gap by developing and evaluating a more modern educational tool (Nasional, 2021). On the other hand, the school dropout rate remains

a major problem in the Indonesian education system, with 22,495 students dropping out of high school in the 2022/2023 academic year (Ministry of Education, Culture, Research, n.d.).

Psychoeducation is an effective approach to improving adolescents' understanding of mental health and providing them with skills to manage emotions and stress. One form of psychoeducation that is appropriate for adolescents' lifestyles is the PENA (Education and Animation) approach, which combines informative education with engaging and easy-to-understand animated visual media (Garcia-Carrion et al., 2019). Schools serve as a critical venue for health interventions because they reach adolescents during key years of their social, physical, and intellectual development. A comprehensive school-based program model should ideally integrate sexual health education, access to health services, and the creation of safe and supportive environments to promote overall well-being and reduce risk behaviors effectively (Wilkins et al., 2023)

Previous studies have shown that animation-based psychoeducation can effectively improve adolescents' understanding of mental health and risky behaviors. However, research utilizing an animation-based psychoeducational approach specifically in Indonesia is still very limited, and most existing studies focus only on single health issues rather than the complex intersection of mental health, TRIAD KRR, and school dropout rates. There is a clear gap in providing a comprehensive and engaging medium that addresses these interconnected risks within the Indonesian school system (Godfrey & Nkengasong, 2023). Furthermore, the use of educational animation has also proven effective in other health contexts, such as a study showing that animated media is more effective than role-playing methods in

improving the quality of life of adolescents with diabetes. Effective communication of sexual and reproductive health (SRH) information is essential for adolescents to make informed decisions and optimize positive health outcomes. Culturally sensitive interventions that facilitate better information exchange between educators, parents, and adolescents are key to improving these health outcomes in middle-income countries ([Agyei, Kaura, & Bell, 2025](#)). ([Hahm et al., 2016](#))The problem formulation in this study is how to improve adolescent mental health through PENA-based psychoeducation (Education and Animation) to prevent TRIAD KRR and dropout. school at PAB 8 Percut Private High School Sei Tuan in 2025. The urgency of sound mental health research in adolescents is fundamental to their optimal development. North Sumatra recorded 18,514 cases of mental disorders in 2022, with data indicating that 34.9 % of Indonesian adolescents experience mental health disorders ([Indonesia National Adolescent Mental Health Survey, 2022](#))

Previous research has shown that animation-based psychoeducation can improve adolescents' understanding of mental health and risky behaviors. However, research utilizing an animation-based psychoeducational approach in Indonesia is still very limited. Therefore, this study aims to fill this gap by developing and evaluating the effectiveness of PENA-based psychoeducation in improving adolescent mental health and preventing risky behaviors associated with the KRR TRIAD, as well as reducing the dropout rate at SMA Swasta PAB 8 Percut Sei Tuan by 2025.

Previous studies have shown that animation-based psychoeducation can effectively improve adolescents' understanding of mental health and risky behaviors. However, research utilizing an animation-based approach specifically in

Indonesia is still very limited, and most existing studies focus only on single health issues rather than the complex intersection of mental health, TRIAD KRR, and school dropout rates. There is a clear gap in providing a comprehensive and engaging medium that addresses these interconnected risks within the Indonesian school system.

The lack of innovative media in Indonesia, where traditional health education often relies on passive leaflets, creates a lack of engagement among digital-native adolescents. Given that 34.9% of Indonesian adolescents experience mental health disorders, a more visually stimulating and interactive approach is urgently needed. This study aimed to evaluate the effectiveness of PENA (Education and Animation)-based psychoeducation in improving knowledge and behavior related to mental health, TRIAD KRR (Risky Sexual Behavior, Drug Abuse, and HIV/AIDS), and dropout prevention among high school students.

Methods

Study Design

This study employed a quasi-experimental design with a pretest-posttest control group approach to measure the effectiveness of the intervention. This research followed the TREND (Transparent Reporting of Evaluations with Nonrandomized Designs) reporting guideline to ensure the quality and transparency of the study. This research was conducted from March to December 2025. This research method is designed systematically to achieve the research objectives, namely, improving the mental health of adolescents through psychoeducation, PENA-based

Participants

This study involved 124 students from SMA Swasta PAB 8 Percut Sei Tuan, Medan,

Indonesia. Participants were selected using a simple random sampling technique. The inclusion criteria were active students aged 15–20 years who were willing to participate in the entire 4-week psychoeducation program. Students who were absent during the pre-test or missed more than two intervention sessions were excluded from the study.

The required sample size was calculated using the Lemeshow formula with a 95% confidence level and 80% statistical power. After adjusting for a 10% anticipated dropout rate, the final sample consisted of 124 participants, with 62 students in the intervention group and 62 students in the control group.

Instruments

Data were collected using a structured questionnaire designed to measure adolescents' knowledge and behavior related to mental health, TRIAD KRR (Risky Sexual Behavior, Drug Abuse, and HIV/AIDS), and school dropout prevention. The instrument consisted of two main sections.

The first section assessed knowledge, which included 10 true/false items related to mental health literacy, risk behaviors, and prevention strategies. Each correct answer was scored as 1, while incorrect answers were scored as 0, with higher scores indicating better knowledge.

The second section measured behavior, consisting of 10 items using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). This section evaluated adolescents' attitudes and preventive behaviors regarding TRIAD KRR and school dropout risk.

Before data collection, the questionnaire underwent validity and reliability testing to ensure its suitability for the study population. The validity test was conducted using Pearson correlation, and all items met the required validity criteria (r

> 0.30). Reliability was assessed using Cronbach's alpha, with a coefficient of > 0.70 , indicating that the instrument had acceptable internal consistency.

Intervention

The intervention consisted of PENA-based psychoeducation (Education and Animation) designed to improve adolescents' knowledge and behaviors related to mental health, TRIAD KRR (Risky Sexual Behavior, Drug Abuse, and HIV/AIDS), and school dropout prevention. The program was implemented over a four-week period, with two sessions conducted each week, resulting in a total of eight psychoeducational sessions.

Each session lasted approximately 45–60 minutes and was delivered in a classroom setting. The intervention utilized animated audiovisual materials that presented scenarios related to emotional regulation, peer pressure, risky sexual behavior, drug use, and the importance of maintaining school participation. The animated content was designed to be engaging, culturally relevant, and appropriate for adolescents, facilitating better comprehension and retention of health-related information.

The sessions were facilitated by trained researchers and followed a structured format consisting of three stages: (1) introduction and presentation of the animated educational material, (2) guided discussion and reflection on the content presented, and (3) reinforcement of key messages related to healthy behaviors and decision-making.

Meanwhile, the control group received the same educational topics through printed leaflets, which contained written information regarding mental health, TRIAD KRR prevention, and the importance of continuing education. No animation-based psychoeducation was provided to this group.

This intervention aimed to compare the effectiveness of animation-based psychoeducation with conventional leaflet-based education in improving adolescents' knowledge and behavior.

Data Collection

Data collection was conducted from March to December 2025 at SMA Swasta PAB 8 Percut Sei Tuan, Medan, Indonesia. Before the intervention, participants in both the intervention and control groups completed a pre-test questionnaire to assess their baseline knowledge and behavior related to mental health, TRIAD KRR (Risky Sexual Behavior, Drug Abuse, and HIV/AIDS), and school dropout prevention.

After the baseline assessment, the intervention group received PENA-based psychoeducation using animation, while the control group received educational information through printed leaflets. The intervention lasted for four weeks, consisting of eight sessions.

At the end of the intervention period, all participants completed a post-test questionnaire using the same instrument administered during the pre-test. The purpose of the post-test was to evaluate changes in participants' knowledge and behavior after the intervention.

Data were collected directly by the research team in a classroom setting, and participants were given clear instructions on how to complete the questionnaire. Each questionnaire required approximately 15–20 minutes to complete. To maintain confidentiality and data accuracy, participants were instructed not to discuss their answers with others during the data collection process.

Data Analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) software. Descriptive statistics were used to summarize respondents' demographic

characteristics, knowledge, and behavioral variables. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using median and interquartile range (IQR).

Before hypothesis testing, a normality test was performed using the Kolmogorov–Smirnov test to determine the distribution of the data. The results indicated that the data were not normally distributed ($p < 0.05$); therefore, non-parametric statistical tests were applied.

To examine differences in knowledge and behavioral outcomes between the intervention group and the control group, the Mann–Whitney U test was used. Statistical significance was determined at a p -value < 0.05 with a 95% confidence level.

In addition, effect size (r) was calculated to measure the magnitude of the intervention effect, providing information on the practical significance of the PENA-based psychoeducation program in improving adolescents' knowledge and behavior related to mental health and TRIAD KRR prevention.

Ethical Considerations

This study received ethical approval from the Health Research Ethics Commission of Mitra Husada Health College, Medan, with approval number 1016/KEP-MHM/VII/2025 before data collection. The study was conducted in accordance with the ethical principles of research involving human participants.

Before participating in the study, all respondents were provided with clear information regarding the purpose, procedures, potential benefits, and voluntary nature of the research. Participants who agreed to take part in the study provided informed consent. For students under the age of 18, permission

was obtained through the school in accordance with institutional regulations.

Participants were assured that their confidentiality and anonymity would be maintained throughout the research process. Personal identifying information was not included in the questionnaire, and all collected data were used solely for research purposes. Participants were also informed that they had the right to

withdraw from the study at any time without any consequences.

Results

This study aims to analyse the effect of PENA-based psychoeducation on improving mental health, TRIAD KRR and Dropout analyze changes in adolescent attitudes after being given PENA-based psychoeducation intervention.

Table 2. Demographic Characteristics of Respondents (n=124)

Characteristic	Category	Intervention		Control		Total	
		N	%	N	%	N	%
Age (years)	15-16	14	11.3	6	4.8	20	16.1
	17-18	36	29.0	43	34.7	79	63.7
	19-20	12	9.7	13	10.5	25	20.2
	Total	62	50.0	62	50.0	124	100
Gender	Female	40	32.3	44	35.5	84	67.7
	Male	22	17.7	18	14.5	40	32.3
	Total	62	50.0	62	50.0	124	100

Based on **Table 2**, Based on the Table, the majority of respondents are in the 17–18-year age group, namely 79 respondents (63.7%), consisting of 36 respondents (29.0%) in the intervention group and 43 respondents (34.7%) in the control group. The 19–20 year age group consists of 25 respondents (20.2%), consisting of 12 respondents (9.7%) in the intervention and 13 respondents (10.5%) in the control. While the 15–16-year age group is the least, namely 20 respondents (16.1%), with details of 14 respondents (11.3%) in the intervention and 6 respondents (4.8%) in the control. Most of the respondents are women, namely 84 respondents (67.7%), with 40 respondents (32.3%) in the intervention and 44 respondents (35.5%) in the control. Meanwhile, there were 40 male respondents (32.3%), consisting of 22 respondents (17.7%) in the intervention group and 18 respondents (14.5%) in the control group. The results showed that most respondents were in the 17–18-year age range.

This aligns with Santrock's (2018) theory of adolescent development, which

states that at this age, individuals are in a transitional period from adolescence to young adulthood, during which significant cognitive and social development occurs. This age is considered a more mature period for receiving information and interventions, particularly in health education programs. Baseline Comparison At the beginning of the study, a baseline comparison was conducted to ensure homogeneity between the intervention and control groups. Statistical analysis showed no significant differences in pre-test scores for knowledge ($p = 0.420$) and behavior ($p = 0.512$), indicating that both groups started at a similar level.

Both groups, the intervention and control, showed a relatively balanced distribution of characteristics, thus being considered homogeneous. This uniformity of characteristics is important because it minimizes bias that may arise due to differences in respondents' demographic backgrounds. Thus, the results of the intervention are more attributable to the treatment given than to other external factors.



Table 3. Frequency Distribution of Adolescents' Knowledge and Behavior (n=124)

Variables	n	Percentage (%)
Behavior		
Good	82	66.1
Not Good	42	33.9
Knowledge		
Good	58	46.8
Not Good	66	53.2

Based on **Table 3**, the majority of respondents had poor knowledge regarding the KRR TRIAD, namely 66 respondents (53.2%). Meanwhile, respondents with good knowledge numbered only 58 respondents (46.8%). In terms of behavior, the majority of respondents showed good behavior in preventing dropout, namely 82

respondents (66.1%). Meanwhile, respondents with bad behavior numbered 42 respondents (33.9%) had bad behavior.

Bivariate analysis is an analysis used on two variables that are suspected to be related or correlated. This bivariate analysis is used to analyze the relationship between the dependent variable and the independent variable.

To determine whether the data is normally distributed, a statistical test using the Kolmogorov-Smirnov test was performed. The normality test in this study is necessary as a prerequisite for analyzing the data used. The results of the normality test for the pre-post intervention and control groups were obtained. The results of the normality test using the Kolmogorov-Smirnov test yielded a p-value of $<0.001 < 0.05$, concluding that the data were not normally distributed. Therefore, the data were analyzed using the Mann-Whitney test.

Table 4. Differences in Adolescent Knowledge in the Intervention and Control Groups after Intervention

Group	N	Mean rank	Sum Of Ranks	p-value
Intervention (PENA Animation)	62	79.65	4938.00	0.015
Control (Leaflet)	62	45.35	2812.00	

Based on the results of the Mann-Whitney test analysis in **Table 4**, it is known that there is a difference in adolescent knowledge between the intervention group given PENA-based psychoeducation (Education and Animation) and the control group that was only given leaflets. The intervention group has a mean rank value = 79.65 with a sum of ranks = 4938.00, while

the control group has a mean rank value = 45.35 with a sum of ranks = 2812.00. The test results show a p-value = 0.015 ($p < 0.05$), which means there is a significant difference between the two groups. Thus, it can be concluded that the PENA animation method is more effective in increasing adolescent knowledge than leaflets.

Table 5. The Influence of PENA Animation on Changes in Adolescent Behavior

Behavior	PENA Animation				Total		p value
	Effective		Not Effective		N	%	
	N	%	N	%	N	%	
Good	70	56.5	12	9.7	82	66.1	0.001
Not Good	24	19.4	18	14.5	42	33.9	
Total	94	75.8	30	24.2	124	100	

Based on **Table 5**, the majority of respondents who received the PENA Animation intervention showed good behavior in preventing TRIAD KRR and dropout, namely 70 respondents (56.5%). Meanwhile, respondents with good behavior but without intervention effects numbered 12 respondents (9.7%). Respondents with bad behavior numbered 42 people (33.9%), consisting of 24 respondents (19.4%) in the effective group and 18 respondents (14.5%) in the ineffective group. The results of the statistical test showed a p-value = 0.001 ($p < 0.05$), which means there is a significant difference between the group of adolescents who received psychoeducation based on PENA Animation and those who did not, so it can be concluded that PENA Animation is effective in improving behavior in preventing TRIAD KRR and dropout.

This study shows that PENA (Education and Animation)-based psychoeducation significantly improved adolescents' knowledge about mental health and the prevention of TRIAD KRR. The Mann-Whitney test showed that the group receiving the PENA-based intervention had a higher mean score (79.65) than the control group (45.35), with a p-value of 0.015, indicating a significant difference in knowledge gain between the two groups. This confirms that animation media is more effective in improving adolescents' understanding than traditional methods such as leaflets.

At the beginning of the study, a baseline comparison was conducted to ensure

homogeneity between the intervention and control groups. Statistical analysis showed no significant differences in pre-test scores for knowledge ($p = 0.420$) and behavior ($p = 0.512$), indicating that both groups started at a similar level.

Knowledge and Behavior Outcomes. Since the data were non-parametrically distributed, results are reported as Median and Interquartile Range (IQR). For the knowledge variable, the intervention group showed a significant increase with a Median of 80 (IQR: 75–85) compared to the control group with a Median of 45 (IQR: 40–50). The Mann-Whitney test confirmed a significant difference between groups with $p = 0.015$. Regarding behavioral changes, the intervention group achieved a Median of 85 (IQR: 80–90), while the control group remained at a Median of 50 (IQR: 45–55). This difference was highly significant with $p < 0.001$ (Confidence Interval 95%: 0.65–0.88).

Effect Size: To measure the magnitude of the intervention's impact, the effect size was calculated. The analysis yielded an effect size (r) of 0.58, which indicates a large effect according to Cohen's criteria. This confirms that PENA-based psychoeducation has a substantial practical impact on improving adolescent health behaviors compared to conventional methods.

In addition to increased knowledge, the study findings also indicate that animation-based psychoeducation influenced adolescents' behavioral changes. The intervention group receiving the PENA animation showed significant



improvements in behaviors related to TRIAD KRR prevention and reduced the risk of dropping out of school. Based on data analysis, 56.5% of respondents in the intervention group demonstrated positive behaviors related to TRIAD KRR prevention, compared to only 9.7% in the control group. The p-value of 0.001 indicates a significant difference, indicating that the PENA animation had a strong influence on changing adolescents' behavior.

Overall, the results of this study support the hypothesis that animation-based psychoeducation can increase knowledge and change behavior in adolescents. Significant behavioral changes in the intervention group indicate that this method is not only effective in providing information but also in motivating more positive behavioral changes. These findings have important implications for developing more effective and engaging adolescent health education programs.

Discussion

The results of this study demonstrate that PENA (Education and Animation)-based psychoeducation is significantly more effective in improving adolescent knowledge and behavior regarding mental health and TRIAD KRR prevention compared to traditional leaflet-based methods. Statistical analysis using the Mann-Whitney test revealed a significant difference in knowledge gains between the two groups, where the intervention group achieved a mean rank of 79.65, substantially higher than the control group's mean rank of 45.35 ($p = 0.015$). This finding highlights that the integration of animation into psychoeducation provides a more effective cognitive stimulus for adolescents than static print media. The visual and auditory appeal of the PENA method likely enhanced information retention and comprehension, aligning with previous research that

emphasizes the superiority of audiovisual media in health literacy programs for youth.

Overall, the results of this study strengthen the evidence that PENA Animation-based psychoeducation is effective in increasing adolescents' knowledge. Animation not only conveys information but also creates a more engaging learning experience, encourages active engagement, and improves retention. This makes animation an appropriate medium for preventing TRIAD KRR and reducing the risk of dropping out of school ([Lai et al., 2016](#)). The effectiveness of PENA Animation in changing behavior can be explained through social learning theory, where adolescents learn by imitating and copying messages presented in an engaging and relevant way ([Costa-Cordella et al., 2022](#)). Animation media provides a contextual, fun, and interactive learning experience, making it more easily accepted by adolescents than conventional media such as flyers. The combination of visuals, text, and audio in PENA Animation not only conveys information but also stimulates emotional aspects that are important in fostering motivation for healthy behaviors.

The effectiveness of the PENA animation method in this study is consistent with findings that technology-driven approaches, such as video edutainment and internet-based programs, are increasingly valuable in sexual and reproductive health education. Innovative video interventions have been proven effective in enhancing adolescent health knowledge and building self-efficacy for safer practices, especially in settings where trained educators are limited ([Ahi et al., 2025](#)). The results of this study also align with findings showing that reproductive health education using video media significantly improves adolescents' attitudes and behaviors related to preventing TRIAD KRR. Audiovisual media not only increase knowledge but also contribute to behavioral change due to their

memorable nature and closer relevance to adolescents' daily lives ([Setyowibowo et al., 2022](#)). This study also shows that intensive education in schools is effective in preventing risky sexual behavior in adolescents, emphasizing the importance of innovative media-based education in modifying behavior. Counseling about TRIAD KRR delivered using innovative methods can produce more meaningful behavioral impacts than traditional methods ([Oliveira et al., 2023](#)).

Furthermore, peer group and game-based youth empowerment has been shown to change adolescent behaviors related to reproductive health. Thus, it can be concluded that the use of PENA Animation as a psychoeducational strategy is not only effective in increasing knowledge but also in changing adolescent behaviors, which in turn can prevent TRIAD KRR and reduce the risk of dropping out of school. The integration of community-based approaches and economic support is also vital in addressing the norms and beliefs surrounding early pregnancy and school dropout, which remain significant challenges in many developing regions ([Zulu, Zulu, Svanemyr, Michelo, & Mutale, 2022](#)). Research also shows that parents play a crucial role in preventing reproductive health issues, particularly those related to casual sex. Most adolescents with non-authoritarian parents have negative attitudes toward casual sex ([Dewi et al., 2023](#)). "Furthermore, while many interventions focus on females, the high prevalence of sexually transmitted infections globally highlights the urgent need for comprehensive programs that include adolescent males in the educational process to ensure a gender-inclusive approach to reproductive health ([Sawalma et al., 2023](#)) ([Zulu, Zulu, Svanemyr, Michelo, & Mutale, 2022](#))

These findings support the importance of educational interventions, such as the

PENA Animation, which not only improve adolescents' knowledge and healthy behaviors. However, they can also strengthen the family's role in preventing risky behavior and school dropout. However, this study also recognizes that knowledge alone does not always translate into preventive actions. Factors such as family support, peer influence, and the presence of social stigma or discrimination play a dominant role in shaping adolescent health behaviors, especially regarding sensitive issues like HIV/AIDS prevention ([Fadjriah, Arifuddin, & Rahman, 2025](#)). Therefore, interventions like PENA animation must not only focus on information delivery but also on strengthening social support systems.

Furthermore, a literature review of TRIAD KRR counseling shows that various forms of educational interventions have proven effective in increasing adolescent knowledge, particularly those using innovative and participatory approaches. For example, the use of a flashcard-based simulation game significantly increased adolescent knowledge about TRIAD KRR ($p < 0.001$). This finding supports the argument that interactive and engaging educational media yield better results than conventional methods, such as leaflets.

However, the results of this study also indicate that while the PENA animation is effective in increasing knowledge, bigger behavioral changes require a more intensive approach. This aligns with the findings of [Setyowibowo et al. \(2022\)](#), who demonstrated that audiovisual media can improve adolescent knowledge and attitudes, but significant behavioral changes often require longer, integrated educational programs. Meanwhile, these findings differ slightly from the research of [Rosyad et al. \(2024\)](#), who reported that leaflets were slightly more effective in increasing knowledge about anemia prevention in adolescents. The learning context, content

quality, and audience characteristics may influence this difference.

It is important to note that while PENA animations are effective in improving adolescents' knowledge and behavior, their effectiveness depends heavily on the interactive nature and relevance of the content to their lives. Research by [Costa-Cordella et al.](#) (2022) shows that adolescents tend to more easily internalize information presented in a fun and contextual manner. Therefore, an animation-based approach not only helps increase knowledge but also fosters emotional engagement and motivation to change behavior.

Overall, these findings confirm that PENA animation-based psychoeducation is an effective method for increasing knowledge and changing adolescents' behaviors in preventing the TRIAD of RRR and reducing the risk of dropping out of school. However, to ensure long-term impact, further research is needed to explore the sustainability of this intervention and its impact across a wider range of educational contexts.

Mechanism via Social Learning Theory. The effectiveness of the PENA animation method in this study can be explained through Social Learning Theory, which posits that individuals learn through observation, imitation, and modeling. Animated videos provide relatable characters and simulated social scenarios that allow adolescents to observe positive decision-making in a risk-free environment. By visualizing complex topics such as emotional management and TRIAD KRR prevention, the intervention fosters emotional engagement and motivates adolescents to internalize and replicate the healthy behaviors modeled on screen. This modeling process is more effective than passive media because it stimulates both cognitive and emotional aspects of learning.

Cultural Context Interpretation: The success of this intervention is also deeply rooted in its sensitivity to the cultural context of adolescents in Indonesia. In many Indonesian communities, topics related to sexual and reproductive health are often considered taboo, leading to high levels of social stigma and limited open communication. The PENA animation provides a safe and engaging platform to bridge this communication gap, delivering sensitive information in a way that reduces moral objections and avoids the discomfort often associated with traditional face-to-face counseling. This approach aligns with current digital-native lifestyles, making health information more acceptable and less intimidating for youth.

Implications and limitations

The findings of this study have significant implications for educational practices, health promotion strategies, and policy development. First, the use of PENA-based psychoeducation, which incorporates animation, can be integrated into school health programs to enhance adolescents' understanding of mental health issues and prevent risky behaviors. This approach offers a more engaging and interactive way to educate students compared to traditional methods like leaflets, making it an effective tool in addressing the stigma surrounding mental health and encouraging positive health-seeking behaviors. Furthermore, this study suggests that multimedia interventions such as animated videos are more effective than text-based methods in conveying complex health information, particularly to adolescents. Consequently, schools and health organizations could consider adopting similar animation-based psychoeducational programs to address mental health and prevent risky behaviors like drug use and early sexual activity. From a policy perspective, the evidence presented here supports the inclusion of innovative

educational methods like PENA animation in national health and education programs targeting adolescents, contributing to more effective mental health education and dropout prevention strategies.

However, there are several limitations to the study that must be acknowledged. The intervention period of four weeks was relatively short, which may not be sufficient to assess long-term behavioral changes. A longer intervention duration and follow-up assessments would be necessary to determine the sustainability of the improvements in knowledge and behavior observed in the study. Additionally, the sample size of 124 students from a single school limits the generalizability of the results. Future research should involve a larger and more diverse sample from various schools and regions to understand better how PENA-based psychoeducation might work in different educational contexts. Another limitation is the reliance on self-reported data, which may introduce bias, as adolescents may overreport behaviors that are socially desirable. To address this, future studies could use more objective data collection methods, such as third-party assessments or behavioral observations. Lastly, the study focused primarily on the effectiveness of the psychoeducational intervention. It did not explore other external factors that may influence adolescent mental health, such as family environment, peer influences, or socio-economic status. Future research should consider these additional factors to gain a more comprehensive understanding of what influences adolescent mental health and behavior.

Relevance to Practice

The findings of this study have important implications for healthcare professionals, educators, and policymakers, offering practical recommendations for improving adolescent health and well-

being. Healthcare practitioners, particularly nurses and mental health professionals, can incorporate PENA-based psychoeducation into their practice by using animation-based interventions to enhance adolescents' understanding of mental health, risky behaviors, and dropout prevention. This approach can be integrated into school health programs, community outreach initiatives, and routine counseling sessions to engage adolescents in a more interactive and effective manner. For institutions, especially schools, adopting these methods as part of the health education curriculum can help address rising mental health concerns and reduce dropout rates. Policymakers should consider supporting the inclusion of animation-based psychoeducation in national health and education programs, recognizing its potential to make mental health education more accessible, engaging, and impactful. Ultimately, this study highlights the potential of multimedia interventions to improve adolescent mental health, prevent risky behaviors, and support better health and educational outcomes for young people.

Conclusion

This study confirms that PENA (Education and Animation)-based psychoeducation is a highly effective tool for enhancing mental health literacy and preventing risky behaviors among adolescents. The use of animated media provides a superior learning experience compared to traditional leaflets, leading to significant and measurable improvements in both knowledge and behavior. These findings suggest that schools and healthcare providers should transition from static educational materials to interactive multimedia interventions to engage the digital-native generation effectively. Future school-based health programs should integrate animation-based modules into the regular curriculum to ensure long-term



sustainability in preventing TRIAD KRR and reducing dropout rates, and further research is recommended to evaluate the long-term retention of these behavioral changes through longitudinal studies across diverse educational settings.

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Conflicts of Interest

There is no conflict of interest.

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Supplementary Materials

Supplementary File S1: Research Instrument contains the full questionnaire used for data collection.

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