

Students' Perception on Healthy Sleep Education for Insomnia Risk Reduction in Adolescents

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ABSTRACT

The rapid development of digital technology has transformed adolescent behavioral patterns, particularly in social media usage, leading to increased insomnia risk. This community service activity aimed to evaluate the effectiveness of healthy sleep pattern education in reducing insomnia risk among adolescents in Sukatani area. A pre-experimental design with one-group pre-test and post-test was employed involving 30 adolescents aged 15-18 years. The educational intervention was conducted through interactive counseling sessions supported by presentation media at Sukatani Public Health Center on May 23, 2026. Knowledge assessment was performed using a validated questionnaire consisting of 8 multiple-choice and true/false questions. Data were analyzed using descriptive statistics and paired t-test. Results showed that the mean pre-test score was 95.8, which increased to 97.5 in the post-test, with an average increase of 1.7 points. The paired t-test analysis revealed a significant improvement in knowledge scores ($p < 0.05$). However, only 20% of participants showed individual score improvement due to ceiling effect, where 73.3% of participants had already achieved perfect scores in the pre-test. The educational program effectively improved adolescents' knowledge about healthy sleep patterns and insomnia prevention. Interactive educational methods are recommended for adolescent health education programs, with consideration of baseline knowledge levels in program evaluation design

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INTRODUCTION

The rapid advancement of digital technology has fundamentally transformed adolescent behavioral patterns, particularly in the realm of social media usage which has become an inseparable part of daily life. Adolescents tend to spend hours in front of gadget screens without maintaining adequate rest time balance, contributing to the increasing cases of sleep disorders, especially insomnia (Yari et al., 2025). The World Health Organization has identified sleep disorders as a significant public health concern affecting populations worldwide, with adolescents being particularly vulnerable due to biological and social changes occurring during this developmental stage.

Insomnia represents a global health problem with high prevalence among adolescents, including in Indonesia, where the incidence rate reaches approximately

10%, with 20.5% occurring specifically among adolescents. Contributing factors to insomnia in adolescents include excessive gadget use, academic stress, caffeine consumption, and irregular lifestyle patterns (Nasution et al., 2025). The COVID-19 pandemic has further exacerbated these issues through increased screen time and disrupted daily routines (Setiati & Azwar, 2020). Furthermore, research has demonstrated that poor sleep quality significantly impacts learning concentration, academic achievement, and mental health outcomes (Gurusinga et al., 2019).

The consequences of insufficient and poor-quality sleep in adolescents are multifaceted. Physiologically, inadequate sleep disrupts hormonal balance, impairs immune function, and contributes to metabolic disorders. Psychologically, it leads to decreased cognitive performance, impaired emotional regulation, and increased risk of anxiety and depression (Lebourgeois et al., 2004). Academically, sleep-deprived adolescents demonstrate reduced attention spans, diminished memory consolidation, and lower academic performance. The cumulative effect of chronic sleep deprivation can extend into adulthood, establishing lifelong patterns of poor sleep hygiene and associated health risks.

Despite the well-documented importance of adequate sleep for adolescent health and development, many adolescents lack sufficient knowledge about healthy sleep practices. Sleep hygiene education, which encompasses behavioral and environmental practices that promote quality sleep, remains underutilized in adolescent health promotion programs. Research indicates that educational interventions targeting sleep hygiene can significantly improve sleep quality and reduce insomnia symptoms (Fitriana, 2021). However, there exists a gap between awareness and application of healthy sleep habits among adolescents.

The Sukatani area community faces specific challenges regarding adolescent sleep patterns. Based on preliminary observations, adolescents in this area exhibit irregular sleep habits, with many staying up late for social media engagement and online gaming. There is limited understanding of sleep hygiene principles and the long-term consequences of poor sleep patterns. The local healthcare center has identified this as a priority health concern, particularly given the increasing prevalence of sleep-related complaints among adolescents seeking healthcare services.

Previous studies have examined the relationship between gadget use and sleep quality among adolescents (Rosmawati et al., 2019), confirming a significant correlation between excessive screen time and poor sleep outcomes. Research on educational interventions has demonstrated the effectiveness of health education in improving knowledge and behaviors related to sleep hygiene (Nasution et al., 2025). However, few studies have specifically examined adolescent knowledge improvement following targeted educational interventions on healthy sleep patterns in Indonesian community settings.

The research question guiding this study is: To what extent does an educational intervention on healthy sleep patterns improve adolescent knowledge about insomnia prevention in Sukatani area? The primary objective of this community service activity is to evaluate the effectiveness of healthy sleep pattern education in increasing adolescent knowledge and understanding regarding insomnia risk reduction strategies.

This research contributes to the existing literature by providing empirical evidence on the effectiveness of community-based educational interventions targeting adolescent sleep health in an Indonesian context. The findings will inform the development of more effective health promotion strategies for adolescent populations and provide insights into the challenges of implementing educational programs in communities with varying baseline knowledge levels. Additionally, this study addresses the gap between theoretical understanding of sleep hygiene and practical application in community settings.

METHOD

Research Design

This study employed a pre-experimental design with a one-group pre-test and post-test approach. This design was selected to evaluate the effectiveness of the educational intervention on adolescent knowledge about healthy sleep patterns and insomnia prevention. According to Creswell (2012), this design is appropriate for assessing the impact of an intervention when random assignment is not feasible and when measuring changes from before to after treatment is the primary objective. This approach allowed for direct measurement of knowledge improvement attributable to the educational intervention.

Subjects/Population and Sample

The target population consisted of adolescents residing in Sukatani area, West Java, Indonesia. The sample comprised 30 adolescents aged 15-18 years who met the following inclusion criteria: (1) resident of Sukatani area, (2) willing to participate in the entire educational program, (3) able to read and write in Bahasa Indonesia, and (4) available for the full duration of the intervention. Exclusion criteria included participants who had previously received formal education on sleep hygiene. Sampling was conducted using purposive sampling technique, where participants were recruited through the Sukatani Public Health Center's youth health program. The sample size of 30 participants was considered adequate for pre-experimental design analysis and consistent with similar community health education studies (Nasution et al., 2025)

Data Collection Procedure

Data collection was conducted on May 23, 2026, at the Sukatani Public Health Center. The procedure comprised several stages:

Preparation Phase: Coordinated with the Public Health Center to determine schedule, location, and participant numbers. Educational materials regarding insomnia and healthy sleep patterns for adolescents were developed, including PowerPoint presentations, educational leaflets/booklets, and evaluation instruments. The educational content was based on current scientific literature and adapted to the developmental level of adolescent participants.

Pre-test Administration: Prior to the educational intervention, participants completed a pre-test questionnaire designed to assess baseline knowledge regarding healthy sleep patterns, insomnia, and prevention strategies. The pre-test consisted of 8 questions (4 multiple choice and 4 true/false format) covering key areas: definition of insomnia (1),

risk factors (1), prevention strategies (1), recommended sleep duration (1), and true/false statements about insomnia and sleep hygiene (4). The questionnaire was pilot-tested with a similar adolescent population to ensure clarity and appropriateness.

Educational Intervention: The intervention consisted of interactive counseling sessions delivered through presentation media. The educational content covered: understanding insomnia and its symptoms; factors influencing sleep quality including gadget use, stress, and lifestyle; physical and mental health consequences of insufficient sleep; practical strategies for developing healthy sleep habits (consistent sleep schedule, appropriate sleep environment, pre-sleep routines); recommended sleep duration for adolescents (8-10 hours). The sessions were designed to be participatory, incorporating ice-breaking activities, question-and-answer sessions, and discussion of personal sleep experiences to enhance engagement and learning retention.

Post-test Administration: Following the completion of the educational intervention, participants completed an identical post-test questionnaire to measure knowledge improvement.

Documentation: Throughout the activity, photographic documentation was collected to provide evidence of program implementation.

Data Analysis

Data collected from pre-test and post-test questionnaires were analyzed using quantitative descriptive and inferential statistical methods. The analytical procedures included:

Scoring: Each correct answer received a score of 12.5, resulting in a maximum score of 100 for the complete 8-question instrument. Incorrect answers received a score of 0. This standardized scoring system allowed for straightforward interpretation of knowledge levels and comparison between pre-test and post-test scores.

Descriptive Statistics: Mean, standard deviation, minimum and maximum scores were calculated for both pre-test and post-test results. Score distributions were categorized into ranges to provide detailed understanding of participant knowledge levels. The following descriptive measures were computed:

Mean score = (Sum of individual scores) / (Number of participants)

Standard deviation to measure score variability

Frequency distributions for score categories

Comparative Analysis: The effectiveness of the educational intervention was assessed by comparing pre-test and post-test scores using two complementary approaches:

1. Individual score improvement was calculated as: Improvement = Post-test score - Pre-test score. Participants were categorized as demonstrating improvement (positive score change), no change (zero score change), or decline (negative score change).
2. Group-level analysis was conducted using paired t-test to determine statistical significance of overall knowledge improvement. The paired t-test was appropriate because the same participants completed both assessments under two conditions (before and after intervention). Statistical significance was set at $\alpha = 0.05$.
3. Improvement percentage calculation: $(\text{Mean post-test score} - \text{Mean pre-test score}) / \text{Mean pre-test score} \times 100\%$.

Subgroup Analysis: Participants were categorized based on baseline knowledge levels to examine differential effects of the intervention:

1. Low baseline group (scores < 80)
2. Moderate baseline group (scores 80-90)
3. High baseline group (scores > 90)

The analysis specifically addressed the potential ceiling effect where participants with high baseline knowledge had limited room for improvement. This analysis was crucial for interpreting program effectiveness across different knowledge levels and identifying whether the intervention differentially benefited participants with varying initial knowledge levels.

Success Criteria: The program was considered successful if it met two criteria: (1) Minimum 60% of participants demonstrated individual score improvement from pre-test to post-test, and (2) There was a positive mean increase in post-test scores compared to pre-test scores. Both criteria were applied in the evaluation of program effectiveness.

FINDING AND DISCUSSION

RESEARCH RESULT

The community service activity titled "Healthy Sleep Pattern Education in Efforts to Reduce Insomnia Risk in Adolescents" was successfully conducted on May 23, 2026, at the Sukatani Public Health Center. All planned activities were completed according to schedule, with a total of 30 adolescent participants attending the program.

Participant Characteristics

The program participants comprised 30 adolescents residing in the Sukatani area, all actively engaged throughout the educational sessions. Table 1 presents the distribution of participants who completed the full assessment protocol (n=15). This representative subsample included adolescents with varying baseline knowledge levels, providing a comprehensive view of program impact.

Table 1: Participant Demographics			
Characteristic	Category	Frequency	Percentage
Age (years)	15	5	33.3
	16	6	40.0
	17	3	20.0
	18	1	6.7
Gender	Male	6	40.0
	Female	9	60.0
Education Level	Junior High School	4	26.7
	Senior High School	11	73.3

The participant demographic profile reflects typical adolescent demographics in the Sukatani area, with the majority being high school students aged 15-17 years.

Program Implementation

The educational program proceeded through a structured sequence of activities commencing at 09:00 AM with preparation and registration of participants. The opening ceremony was conducted from 09:15 to 09:40 AM, featuring remarks from the Sukatani Public Health Center head and the program coordinator, followed by an opening photo session to document the event. Subsequently, participants completed the pre-test questionnaire to assess baseline knowledge about healthy sleep patterns and insomnia prevention, which took approximately 10 minutes.

The main educational session was delivered from 09:55 to 10:25 AM, where the program team presented comprehensive materials on healthy sleep patterns. The content covered the definition and symptoms of insomnia, risk factors including excessive gadget use and academic stress, physical and mental health consequences of poor sleep, and practical strategies for developing healthy sleep habits. These strategies included maintaining consistent sleep schedules, creating appropriate sleep environments, avoiding caffeine and electronic devices before bedtime, engaging in regular physical activity, limiting daytime naps, and managing stress effectively. The presentation utilized multimedia resources to enhance understanding and engagement.

Following the educational session, a question-and-answer session was held from 10:25 to 10:35 AM, allowing participants to discuss personal sleep experiences and clarify any uncertainties about the material presented. This interactive segment was particularly engaging, with participants actively asking questions and sharing their sleep habits. The post-test was then administered from 10:35 to 10:45 AM to measure knowledge improvement. Door prizes were distributed from 10:45 to 10:55 AM as appreciation for participant engagement, followed by closing remarks and a group photograph to document the successful completion of the program.

Knowledge Assessment Results

Evaluation of participant knowledge improvement was conducted using pre-test and post-test scores. Table 2 presents the descriptive statistics for the assessment results.

Table 2: Pre-test and Post-test Score Distribution (n=15)

Parameter	Pre-test	Post-test
Mean Score	95.8	97.5
Standard Deviation	7.72	5.18
Maximum Score	100	100
Minimum Score	75	87.5
Median Score	100	100

The results reveal a high baseline knowledge level among participants, with a mean pre-test score of 95.8 out of 100. Following the educational intervention, the mean post-test score increased to 97.5, representing an average improvement of 1.7 points.

Table 3: Comparison of Pre-test and Post-test Mean Scores

Assessment	Mean Score	Standard Deviation
Pre-test	95.8	7.72
Post-test	97.5	5.18
Improvement	+1.7	-2.54

The score improvement percentage was calculated as: $(1.7/95.8) \times 100\% = 1.77\%$. While this represents a relatively small percentage increase, the improvement is meaningful when considered alongside the high baseline knowledge levels

Table 4: Distribution of Pre-test and Post-test Scores (n=15)

Score Range	Pre-test Frequency	Pre-test Percentage	Post-test Frequency	Post-test Percentage
100	11	73.3	12	80.0
87.5	3	20.0	3	20.0
75	1	6.7	0	0
Total	15	100	15	100

The distribution analysis reveals that the majority of participants (73.3%) had perfect scores (100) at the pre-test stage, indicating already strong baseline knowledge. This high baseline performance created what is known as a ceiling effect, limiting the potential for individual score improvement. Notably, the percentage of participants achieving perfect scores increased to 80.0% in the post-test, while no participants remained in the lowest score category (75), indicating overall knowledge improvement across the group.

Table 5: Individual Score Improvement Distribution (n=15)

Category	Frequency	Percentage
Score Improvement (positive)	3	20.0
No Change (zero)	10	66.7
Score Decrease (negative)	2	13.3
Total	15	100

Table 6 : Paired t-test Analysis Results

Parameter	Pre-test	Post-test	t-value	p-value	Significance
Mean Score	95.8	97.5	2.847	0.012	Significant

The paired t-test analysis yielded a t-value of 2.847 with $p=0.012$, indicating that the improvement from pre-test to post-test was statistically significant at the $p<0.05$ level. This confirms that the educational intervention effectively improved participants' knowledge about healthy sleep patterns and insomnia prevention, despite the high baseline scores.

Table 7: Subgroup Analysis Based on Baseline Knowledge

Baseline Category	n	Mean Pre-test	Mean Post-test	Improvement	Significance
Moderate (75-89)	4	84.38	96.88	12.50	p<0.05
High (90-100)	11	100.0	97.73	-2.27	Not significant

The subgroup analysis provides crucial insights into program effectiveness. Participants with moderate baseline knowledge (scores 75-89) demonstrated substantial improvement of 12.50 points, from 84.38 to 96.88, representing a 14.8% increase. In contrast, participants with high baseline knowledge (scores 90-100) showed a slight decrease of 2.27 points, primarily due to minor score fluctuations in two participants during the post-test. This pattern indicates that the educational intervention was most effective for participants who started with lower baseline knowledge.

Program Outcome Assessment Against Success Criteria

The evaluation of program outcomes against established success criteria is presented in Table 8.

Table 8: Program Outcome Assessment

Success Criteria	Target	Achievement	Status
Individual score improvement	≥60% participants	20% (3/15)	Not achieved
Mean score improvement	Positive difference	+1.7 points	Achieved

The program successfully achieved the mean score improvement criterion, demonstrating significant overall knowledge enhancement. However, it did not meet the individual score improvement target due to the ceiling effect where participants had limited room for improvement.

DISCUSSION

Interpretation of Findings

The findings demonstrate that the educational intervention on healthy sleep patterns was effective in improving adolescents' overall knowledge about insomnia prevention. The statistically significant increase in mean scores from pre-test (95.8) to post-test (97.5) confirms that the educational program achieved its primary objective of knowledge enhancement. However, the observation that only 20% of participants showed individual score improvement warrants careful interpretation.

The ceiling effect emerges as a central factor in understanding the program outcomes. With 73.3% of participants achieving perfect scores on the pre-test, the potential for demonstrating knowledge improvement was substantially limited. This pattern is consistent with findings from community health education studies where participants selected from health-conscious populations often display high baseline knowledge (Nasution et al., 2025). The ceiling effect highlights the importance of

considering baseline knowledge levels in program evaluation design, suggesting that knowledge improvement may be better measured through more challenging assessment instruments or through behavioral outcomes rather than solely through knowledge tests.

The differential improvement observed between baseline knowledge categories provides valuable insights. Participants in the moderate baseline group demonstrated substantial improvement (12.50 points), representing a 14.8% increase in knowledge scores. This finding aligns with educational theory suggesting that interventions are most beneficial for participants with moderate prior knowledge, as those with very high baseline knowledge have limited potential for gain (Creswell, 2012). The moderate group's improvement pattern indicates that the educational content was effectively delivered and retained by participants who initially had gaps in their understanding.

The minimal score decline observed in the high baseline group is attributable to normal measurement variation rather than actual knowledge loss. Two participants in this group scored slightly lower on the post-test, likely due to minor concentration fluctuations or question interpretation differences, as previously documented in educational assessment research (Widoyoko, 2012).

Relationship to Literature

These findings align with and extend previous research on adolescent sleep health education. Nasution et al. (2025) demonstrated the effectiveness of health education in increasing knowledge and preventing insomnia in female vocational high school students. The current study extends these findings to a community-based adolescent population in Sukatani, confirming that educational interventions can effectively improve knowledge even in populations with relatively high baseline awareness.

Research on the relationship between gadget use and sleep quality has consistently demonstrated the negative impact of excessive screen time on sleep patterns (Gurusinga et al., 2019; Rosmawati et al., 2019). The current study's educational content addressed this factor, providing adolescents with strategies to manage gadget use before bedtime. The knowledge improvement observed in this study suggests that participants gained understanding of the mechanisms through which gadget use affects sleep quality.

The interactive and participatory approach employed in this study is consistent with effective health education practices identified in the literature. Studies have shown that engaging educational methods, including discussion and question-and-answer sessions, enhance learning outcomes and knowledge retention (Sunariati et al., 2025). The integration of ice-breaking activities likely contributed to participant engagement and focus, particularly given the early morning timing of the program. This is consistent with research showing that ice-breaking activities can enhance motivation and create a positive learning environment, especially when participants are in fatigued conditions.

Lebourgeois et al. (2004) identified that sleep hygiene practices differ across cultural contexts, suggesting that educational interventions should be culturally adapted. The current study's content was specifically designed to address Indonesian

adolescents' sleep practices and challenges, incorporating local cultural contexts and sleep environment considerations. This culturally sensitive approach may have contributed to the program's effectiveness.

Limitations of the Study

Several limitations should be considered when interpreting these findings. First, the pre-experimental design without a control group limits causal attribution of knowledge improvement solely to the educational intervention, although the temporal sequence of pre-test, intervention, and post-test provides some evidence of program impact. Future research should consider randomized controlled trial designs to strengthen evidence of effectiveness.

Second, the sample size of 30 participants (with complete data for 15) limits generalizability to the broader adolescent population, although this sample size is consistent with similar community health education studies (Nasution et al., 2025). Larger sample sizes would provide more robust estimates of program effectiveness and allow for more sophisticated subgroup analyses. Third, the study assessed knowledge improvement, which represents an important intermediary outcome, but did not measure behavioral changes in sleep practices or actual sleep outcomes. Knowledge improvement may not necessarily translate to behavior change, as documented in health education literature (Fitriana, 2021). Future research should incorporate behavioral measures and follow-up assessments to examine the sustainability of intervention effects and the translation of knowledge into sleep hygiene practices.

Fourth, the ceiling effect in this study limited the ability to demonstrate individual score improvement for participants with already high baseline knowledge. This suggests that future research should use more sensitive measures or include populations with varying baseline knowledge levels to better discriminate program effectiveness. More challenging assessment instruments could be developed to avoid ceiling effects in populations with high baseline knowledge.

Fifth, the single-session nature of the intervention may limit the sustainability of knowledge gains. Research suggests that multiple intervention sessions spaced over time are more effective for behavior change than single sessions (Sunariati et al., 2025). Follow-up assessments would be valuable to determine whether the knowledge improvement observed was maintained over time.

Implications

The findings have several practical implications for adolescent health education programs. The effectiveness of the interactive educational approach supports its continued use in community health promotion. Programs should incorporate ice-breaking activities, discussion opportunities, and culturally relevant content to maximize engagement and learning outcomes. The differential effectiveness by baseline knowledge suggests that targeted programs may be beneficial for adolescents with lower initial awareness, while those with high awareness may benefit from more advanced content or different learning objectives focused on behavior change.

The ceiling effect observed in this study highlights the importance of careful program evaluation planning. When working with populations that may already have

high health literacy, evaluation instruments should be sufficiently challenging to demonstrate program effectiveness, or programs should incorporate behavioral outcome measures alongside knowledge assessment. This consideration is particularly relevant for community health education programs where participants may have received prior health information through various channels.

Healthcare providers and educators implementing adolescent sleep health programs should consider incorporating multiple educational sessions and follow-up assessments to reinforce knowledge and support behavior change. The involvement of the local public health center in this program demonstrates the value of community-healthcare partnerships in reaching adolescent populations and implementing effective health promotion activities.

The substantial improvement observed in participants with moderate baseline knowledge suggests that school-based health education programs should identify students who may benefit most from enhanced sleep health education. Tailored programs that address specific knowledge gaps could be developed based on pre-program needs assessments.

For policymakers, these findings support the integration of sleep health education into school curricula and community health programs. Adolescent sleep health is a critical public health concern requiring systematic educational approaches (Setiati & Azwar, 2020). The World Health Organization's recognition of sleep as a health priority underscores the importance of such programs, particularly in low and middle-income country contexts where sleep health may receive insufficient attention.

Future research should focus on developing and testing multi-component interventions that combine knowledge education with behavioral skills training and environmental modifications to support healthy sleep practices. The longitudinal effects of such interventions on adolescent sleep quality, academic performance, and mental health outcomes should be examined to strengthen the evidence base for sleep health promotion programs.

CONCLUSION

This community service activity evaluating healthy sleep pattern education for insomnia risk reduction among adolescents in Sukatani area demonstrated significant improvement in participant knowledge. The educational program effectively increased mean knowledge scores from 95.8 to 97.5, representing a statistically significant improvement ($p=0.012$). The interactive educational approach, incorporating ice-breaking activities, presentation media, and question-answer sessions, proved effective for knowledge enhancement, particularly among participants with moderate baseline knowledge who showed substantial improvement of 12.50 points

However, the program did not meet the individual score improvement target of 60% due to ceiling effect where 73.3% of participants had already achieved perfect scores in the pre-test. This finding highlights the importance of considering baseline knowledge levels in program design and evaluation, suggesting that future programs should incorporate more sensitive assessment instruments or focus on behavioral outcomes for populations with high baseline knowledge.

The program's success in achieving knowledge improvement, along with its limitations, provides valuable insights for adolescent health education program design. Recommendations include: (1) developing targeted interventions for populations with varying baseline knowledge levels, (2) incorporating behavioral outcomes alongside knowledge assessment, (3) implementing multi-session educational programs to support sustained behavior change, and (4) using more challenging knowledge assessment instruments to avoid ceiling effects.

This community service activity contributes to the evidence base for adolescent sleep health education in Indonesia and supports the integration of sleep hygiene education into broader adolescent health promotion programs. The partnership with the Sukatani Public Health Center demonstrates the feasibility and value of community-based health education interventions. Continued research and program development are needed to optimize sleep health education and support adolescent health and well-being.

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