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The Relationship Between Gadget Use and Sleep Patterns Among Teenagers at SMA PGRI 2 Denpasar

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ABSTRACT

Background: Excessive gadget use among adolescents may disrupt sleep patterns and reduce sleep quality. Blue light exposure and stimulating digital activities before bedtime can interfere with circadian rhythms and delay sleep onset. This study aimed to examine the relationship between gadget use and sleep patterns among students at SMA PGRI 2 Denpasar. **Methods:** A cross-sectional quantitative design was employed, involving 145 students aged 14–19 years selected through simple random sampling. Data were collected via online questionnaires assessing gadget usage (duration and frequency) and sleep behaviors (sleep duration, quality, and disturbances). Spearman Rank correlation was used for statistical analysis. **Results:** Most respondents used gadgets for more than 2.5 hours daily, especially before bedtime. While 69.0% reported appropriate gadget use duration, 86.9% experienced poor sleep patterns. A significant negative correlation was found between gadget use duration and sleep patterns ($r = -0.270$; $p = 0.001$), indicating that longer usage was associated with poorer sleep. However, the frequency of gadget use showed a weak, non-significant positive correlation ($r = 0.127$; $p = 0.129$). **Conclusion:** Gadget use duration significantly affects adolescent sleep patterns, while usage frequency does not. Sleep hygiene education and behavioral interventions are recommended to reduce bedtime gadget use and improve sleep quality.

Keywords: Adolescent; gadgets; sleep pattern; high school; Denpasar

1. INTRODUCTION

A gadget is a small electronic device or instrument with various functions. Most people often use gadgets one hour before bedtime, which can trigger physiological and psychological processes that disrupt sleep patterns.[1] A gadget is a small electronic device or instrument designed to perform specific functions that simplify or enhance daily activities. In modern life, gadgets such as smartphones, tablets, and laptops have become essential tools for communication, entertainment, and information access. However, frequent use of these devices, especially one hour before bedtime, can negatively affect sleep quality. The blue light emitted from gadget screens suppresses melatonin production—the hormone responsible for regulating sleep cycles—thereby delaying the onset of sleep. Moreover, engaging in stimulating activities such as scrolling social media, watching videos, or playing games can increase alertness and mental activity, making it harder to relax. This habit can lead to disrupted circadian rhythms, difficulty falling asleep, and reduced sleep duration. Over time, poor sleep quality may contribute to fatigue, decreased

concentration, and even emotional disturbances such as anxiety or irritability.

According to research in the 2018 journal Child and Adolescent Psychiatric Clinics of North America, children who use gadgets before bedtime experience sleep disturbances at night and do not get good quality sleep.[2] Based on a report by the WHO (World Health Organization), one of the health problems among adolescents aged 11-19 years is a lack of quality sleep due to gadget addiction. According to the Ministry of Communication and Information Technology (*Kominfo*) in 2019, gadget usage among adolescents aged 9 to 18 years in Indonesia reached 65.34%.[3] According to Khusnal in 2017, sleep can restore and rest the human body. One of the factors that cause teenagers to experience poor sleep quality is lifestyle changes, including the use of gadgets.[4] Efforts that can be made to reduce sleep pattern disturbances for gadget users include maintaining a sleep routine by keeping consistent sleep times, creating a comfortable sleeping environment so that the body can relax more, limiting gadget use to a minimum of 2-3 hours before bedtime, exercising regularly to help reduce tension, and meditating or relaxing before bed to help calm the mind.[5]

The use of gadgets among junior high school students is influenced by several environmental and individual factors. Environmental factors include the easy availability of devices (smartphones/tablets), lenient parental control over screen time, and increased online learning demands since the COVID-19 pandemic. Individual factors involve social needs (interaction through social media), identity exploration, and addictive behavior toward notifications and entertainment content. Excessive gadget use—especially at night—disrupts the circadian rhythm through blue light exposure that suppresses melatonin production, delaying sleep onset and reducing total sleep duration. Short-term impacts include daytime sleepiness, decreased concentration, and lower academic achievement. Long-term consequences, as reported in the literature, include an increased risk of mood disorders, symptoms of depression and anxiety, and a decline in overall mental well-being, particularly when usage focuses on recreational social media. However, this relationship is complex and influenced by the type of device, content quality, and level of physical activity, meaning not all screen exposure is equally harmful. Recommended interventions include setting screen-time limits, implementing "no-phone" policies before bedtime, encouraging physical activity, and promoting media literacy education among adolescents and parents to mitigate negative effects.[6,7]

Efforts to reduce the negative impact of gadget use among junior high school students should integrate school-based, family-based, and individual behavioral approaches. School programs that include media literacy education, structured schedules for device use, and increased physical activities have been shown to effectively reduce overall screen time and promote healthier lifestyles when implemented consistently as part of the curriculum. Moreover, behavioral change strategies such as goal setting, feedback, and activity substitution planning have been associated with successful screen-time reduction; brief and structured interventions involving parental participation tend to produce faster results.[8]

At home, establishing clear household rules—such as banning gadgets in bedrooms and implementing a "no-screen hour" before bedtime—combined with parental role modeling can significantly decrease nighttime screen exposure and improve sleep quality. Interventions should also be personalized, focusing on the type of gadget use (entertainment vs. educational), time of use, and adolescents' readiness for behavioral change. Continuous monitoring, peer support, and the use of screen-time management applications further enhance these efforts. Overall, evidence suggests that combining behavioral and environmental strategies can effectively reduce screen time and improve adolescents' sleep patterns and well-being.[9]

SMA PGRI 2 Denpasar is a private school located in the city of Denpasar. Based on the results of a preliminary study at SMA PGRI 2 Denpasar, it was found that all adolescents have their own gadgets. According to school rules, there are no violations regarding students bringing gadgets to school. From brief interviews with 17 students in grades X, XI, and XII, they said they used gadgets for 1 to 12 hours before bedtime, slept only 4-6 hours because they had difficulty falling asleep and often woke up during the night, and felt weak and sleepy every time they woke up in the morning.

2. METHODS

2.1 Research Design

This study employed a non-experimental quantitative approach with a cross-sectional analytical design. This design was chosen to identify the relationship between gadget usage patterns and sleep

patterns among adolescents within a specific period of time without direct intervention.

2.2 Population

The study population included all students of SMA PGRI 2 Denpasar, consisting of grades X, XI, and XII. This population was considered relevant as it represents adolescents who are susceptible to changes in sleep patterns due to gadget use.

2.3 Sample

The sample consisted of 145 students aged 14–19 years who met the inclusion criteria: actively enrolled as students, willing to participate, and having signed informed consent. Sampling was conducted during the period of April–May 2025.

2.4 Sample Size Determination

The sample size was determined using a practical approach, taking into account the number of students who met the inclusion criteria and agreed to participate.

2.5 Sampling Technique

The sampling technique used was probability sampling with a simple random sampling approach. Each eligible student had an equal opportunity to be selected as a respondent.

2.6 Research Variables

Independent Variable: Gadget usage patterns among adolescents, including duration, frequency, and time of use. Dependent Variable: Sleep patterns and sleep quality, including sleep duration, bedtime, and sleep disturbances.

2.7 Data Collection Instrument

Data were collected using a structured online questionnaire distributed via Google Forms. The questionnaire included demographic information, gadget usage habits, and sleep behaviors, developed based on relevant indicators.

2.8 Statistical Analysis

Data analysis was performed using the Spearman Rank correlation test to examine the relationship between gadget usage patterns and sleep patterns. The significance level was set at 0.05, with interpretation based on the p-value and correlation coefficient.

3. RESULTS

The subjects in this study were students at SMA PGRI 2 Denpasar. The subjects were selected for the variables of gadget use and sleep patterns among adolescents. The sample size was 145 people. The characteristics of the research sample were based on age, gender, education, and occupation.

Table 1 presents the distribution of respondents' characteristics related to gadget use based on age, grade, and gender. The majority of respondents were aged 17–19 years (72.4%), while those aged 14–16 years accounted for 27.6%. In terms of grade level, most respondents were in grade XII (50.3%), followed by grade X (26.3%) and grade XI (23.4%). Regarding gender, male students constituted a slightly higher proportion (52.4%) compared to female students (47.6%). Overall, these findings indicate that the sample was predominantly composed of older adolescents, particularly those in their final year of high school, with a fairly balanced distribution between male and female respondents.

Table 1. Characteristics of gadget use based on age, grade, and gender at SMA PGRI 2 Denpasar

Characteristics	Frequency	Percentage
Age		
14 – 16 years	40	27.6
17 – 19 years	105	72.4
Grade		
X	38	26.3
XI	34	23.4
XII	73	50.3
Gender		
Male	76	52.4
Female	69	47.6
Total	145	100.0

Table 2 shows that most respondents reported appropriate gadget use duration (69.0%) and low frequency of use (53.1%). However, the majority experienced poor sleep patterns (86.9%) and only 13.1% reported good sleep patterns. Regarding subjective sleep quality, 59.3% rated their sleep as fairly good, while 32.4% rated it as poor or very poor. Similar trends were observed for sleep latency and sleep duration, with most students reporting fairly good scores but a considerable proportion indicating poor or very poor quality. Overall, despite moderate gadget use, sleep disturbances and suboptimal sleep quality were prevalent, indicating a

potential negative impact of gadget use on adolescent sleep patterns.

Table 2. Distribution of duration and frequency gadget use and sleep patterns at PGRI 2 High School in Denpasar

Variable	Frequency	Percentage
Duration of gadget use		
Appropriate	100	69.0
Not appropriate	45	31.0
Frequency of gadget use		
High	68	46.9
Low	77	53.1
Sleep patterns		
Good	19	13.1
Poor	126	86.9
Subjective sleep quality		
Very good	12	8.3
Fairly good	86	59.3
Poor	38	26.2
Very poor	9	6.2
Sleep latency		
Very good	39	26.9
Fairly good	52	35.9
Poor	45	31.0
Very poor	9	6.2
Sleep duration		
Very good	25	17.2
Fairly good	76	52.4
Poor	35	24.1
Very poor	9	6.3
Total	145	100.0

Table 3 shows the relationship between the duration of gadget use and sleep patterns among adolescents. The majority of respondents who had appropriate gadget use duration reported good sleep patterns (93 respondents or 93.0%), whereas among those with inappropriate gadget use duration, a larger proportion exhibited poor sleep patterns (12 respondents or 26.7%). The results of the Spearman's Rho correlation test revealed a negative and statistically significant correlation between gadget use duration and sleep patterns ($r = –0.270$; $p = 0.001$; $n = 145$). This indicates that the longer the duration of gadget use, the poorer the sleep patterns observed among the students. Conversely, students who limited gadget use demonstrated more appropriate sleep patterns. The p-value of 0.001, which is lower than the 0.05 significance threshold, confirms that the relationship is statistically significant. These findings suggest that prolonged gadget use, especially during hours close to bedtime, may contribute to disturbances in adolescents' sleep routines and overall sleep quality.

Table 4, the results of the Spearman's rank correlation analysis between gadget usage frequency and sleep patterns among adolescents showed a correlation coefficient of 0.127 with a p-value of 0.129, indicating a positive but weak correlation that is not statistically significant at the 0.05 level. Cross-tabulation results revealed that among respondents with poor sleep patterns, 82.4% were in the high gadget use category, while 17.6% were in the low gadget use category. Meanwhile, among those with good sleep patterns, 90.9% were in the high gadget use category and 9.1% in the low gadget use category. Although there is a tendency for high gadget usage in both groups, the statistical test indicates that gadget usage frequency is not significantly associated with sleep patterns in this sample. This weak and non-significant correlation suggests that other factors may play a more dominant role in influencing adolescents' sleep patterns, such as daily routines, academic demands, or environmental conditions.

Table 3. Relationship between gadget usage duration and sleep patterns

Sleep patterns	Duration of gadget use				Total		*p*-value
	Appropriate		Not appropriate				
	F	%	F	%	F	%	
Poor	7	7.0	12	26.7	19	13.1	0.001
Good	93	93.0	33	73.3	126	86.9	
Total	100	100.0	45	100.0	145	100.0	
Correlations							
Spearman's Rho					Duration of gadget use		
	Sleep patterns		Correlation coefficient		-0.270		
			Sig. (2 tailed)		0.001		
			N		145		

Table 4. Relationship between gadget usage frequency and sleep patterns

Sleep patterns	Frequency of gadget use				Total		*p*-value
	Low		High				
	F	%	F	%	F	%	
Poor	12	17.6	7	9.1	19	13.1	0.129
Good	56	82.4	70	90.9	126	86.9	
Total	100	100.0	45	100.0	145	100.0	
Correlations							
Spearman's Rho					Frequency of gadget use		
	Sleep patterns		Correlation coefficient		0.127		
			Sig. (2 tailed)		0.129		
			N		145		

4. DISCUSSION

Our cross-sectional analysis found a weak positive correlation (Spearman's rho = 0.127) between frequency of gadget use and adolescents' sleep patterns that was not statistically significant (p = 0.129). This result indicates that, within this sample of SMA PGRI 2 Denpasar students, higher reported gadget frequency alone did not translate into a clear, statistically detectable deterioration of overall sleep pattern scores. Several explanations—methodological and substantive—can account for this finding.

Several previous studies have shown that the duration or intensity of gadget use is not the sole factor influencing adolescents' sleep quality. Other factors such as the type of activity performed with gadgets, the time of use before bed, academic stress, and lifestyle habits can also play a significant role in determining sleep patterns. Therefore, the relationship between gadget use and sleep in adolescents appears to be complex and multifactorial, requiring further analysis considering mediating variables such as the duration of blue light exposure, physical activity, and parental supervision of gadget use before bed.[10,11]

The findings of this study, which showed a positive but insignificant correlation between the frequency of gadget use and adolescents' sleep patterns, align with several other studies that suggest that the effect of gadget use on sleep quality is not always consistent and can be influenced by various contextual factors. Research by Carter et al. (2016) found that although digital device use is often associated with decreased sleep duration, the association was stronger when gadgets were used within the hour before bedtime compared to total daily usage frequency.[12,13] Similarly, Vernon et al. (2021) reported that the effect of gadgets on sleep was more influenced by the type of digital activity—such as playing games or accessing interactive social media—than by the frequency of gadget use.[14]

Furthermore, research by Levenson et al. (2017) also emphasized that the duration of blue light exposure, not just the frequency of use, plays a significant role in suppressing melatonin secretion and delaying sleep onset.[15] This suggests that adolescent sleep quality depends not only on the intensity of gadget use, but also on the context of time and type of use.[16] Therefore, the findings of this study reinforce the view that the relationship between gadget use and adolescent sleep patterns is complex and multidimensional, requiring an analytical approach that considers psychosocial, behavioral, and environmental variables that influence sleep habits.[17]

Third, physiological mechanisms such as blue-light exposure and psychological arousal provide plausible pathways linking evening device use and sleep disturbance. Experimental and review evidence indicate that evening exposure to short-wavelength (blue) light can suppress melatonin and increase alertness, and that emotionally arousing or socially engaging content raises pre-sleep arousal; both mechanisms can lengthen sleep latency and reduce sleep quality. However, controlled trials and experimental studies report mixed effect sizes depending on exposure duration, device settings (brightness / blue-light filters), and participant age. Such complexity may partly explain why a simple frequency measure yields only a weak, non-significant correlation in a field survey.[18-20]

Fourth, confounding and moderating variables likely influence the relationship in adolescents. Factors such as physical activity level, academic workload, caffeine intake, mental health (stress, anxiety), household

rules about devices, and school start times have been associated with sleep outcomes and may mediate or confound relationships with gadget use. Some large population and cohort studies show that screen effects on sleep are stronger in adolescents with lower physical activity or higher evening arousal; conversely, strong parental rules and good sleep hygiene attenuate adverse impacts. Our analysis did not adjust for many potential confounders, which could mask an underlying effect.[21,22]

Fifth, the magnitude and clinical relevance of observed associations deserve comment. Even when statistical significance is not achieved, small shifts in sleep timing or duration at the population level can accumulate and affect daytime functioning, mood, and academic performance. Public-health guidance therefore often focuses on practical mitigation (limiting interactive screen use near bedtime, consistent sleep routines, reducing bedroom device presence) which multiple studies and reviews endorse as reasonable precautionary measures. In practice, interventions that target timing, content, and context (e.g., removing devices from the bedroom, enforcing 'no-screens' 1–2 hours before bed, promoting evening relaxation) have shown promise in improving sleep metrics in adolescents.[23,24]

Implications for research and practice. Future research should use longitudinal designs and objective measures of both device use (app logs, screen-time trackers) and sleep (actigraphy) to clarify causality and dose–response relations. Intervention studies that focus on reducing interactive/bedtime use and testing blue-light mitigation strategies (filters, eyewear, dimming) would be informative in the local context.[25-27] For clinical and school health practice, promoting consistent sleep schedules, limiting evening device exposure (especially interactive content), encouraging physical activity, and educating parents and students about sleep hygiene remain pragmatic recommendations while stronger causal evidence accumulates.[17]

Limitations. Aside from the cross-sectional design and self-report measures noted above, this study's sample is drawn from a single high school and may not generalize to other regions or to adolescents with different socioeconomic or cultural backgrounds. The exposure measure (frequency) did not disaggregate by time-of-use, device type, or content, which are important moderators. Finally, the analysis did not control for several possible confounders (e.g., exercise, caffeine, mental health), which limits causal interpretation.[28-29]

5. CONCLUSION

This study found a weak and non-significant positive correlation between gadget usage frequency and sleep patterns among adolescents at SMA PGRI 2 Denpasar. Although a higher proportion of students with both good and poor sleep patterns reported high gadget usage, the statistical analysis ($p = 0.129$) indicates that gadget use alone does not significantly affect adolescents' sleep patterns. These findings suggest that other factors, such as daily routines, academic demands, physical activity, and environmental influences, may have a stronger impact on sleep quality. Based on these results, it is recommended that schools, parents, and health educators implement comprehensive sleep hygiene education programs that not only emphasize reducing gadget use before bedtime but also address broader lifestyle habits. Adolescents should be encouraged to set regular sleep schedules, limit gadget use at least 2–3 hours before bedtime, and create a comfortable sleep environment. Future research should use larger and more diverse samples and consider longitudinal or experimental designs to better understand causal relationships between gadget use and sleep disturbances in adolescents.

Ethical Approval

The ethics for this research were obtained from the Research Ethics Committee of the Denpasar Ministry of Health Polytechnic with letter number: DP.04.02/F.XXXII.25/658/2025.

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Competing Interests

All the authors declare that there are no conflicts of interest.

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Underlying Data

Derived data supporting the findings of this study are available from the corresponding author on request.

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