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ADDICTION TO GADGET USE WITH SLEEP QUALITY AND ADOLESCENT ACHIEVEMENT INDEX IN ADOLESCENTS

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ABSTRACT
Generation Z today cannot go a day without gadgets. Over time, Generation Alpha is likely to become similarly preoccupied with gadgets, as they have been influenced by technology since birth and view it as an essential tool for both school and other activities. Excessive gadget use negatively impacts the quantity and quality of sleep. This study employed a cross-sectional design to analyze the relationship between gadget addiction, sleep quality, and academic performance among adolescents in the coastal and mountainous areas of Pidie Regency. The sample consisted of 337 students from Kembang Tanjong High School and 159 students from Tangse High School, selected using a total sampling technique. Data were analyzed using the Mann-Whitney test and linear regression. The results showed no significant differences in the average sleep quality and gadget addiction levels between adolescents in coastal and mountainous regions. However, there was a significant difference in the average academic performance between these two groups. Factors associated with sleep quality included age, male gender, mothers' lower education level, gadget addiction, and anxiety. Meanwhile, factors influencing academic performance were male gender, gadget addiction, social media motives, ease of gadget access, depression, and anxiety. Adolescents are encouraged to reduce gadget usage, as it adversely affects sleep quality and academic performance. They can replace gadget usage with positive activities such as physical exercise, playing sports, socializing with peers, studying together, and other productive activities.

Keywords: achievement indeks; gadget addiction; sleep quality

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INTRODUCTION

Technological advancements are inevitable as time progresses (Pebriana, 2017). Gadgets among early childhood (ages 4–6) have a negative impact on children due to the lack of two-way communication. Ideally, communication should be two-way; however, children using gadgets experience only one-way interaction. Children engrossed in their gadgets often resist playing with others and may become irritable when interrupted during gadget use (T. P. Sari & Mitsalia, 2016). Gadgets are no longer exclusive to adults and teenagers; preschool-aged children (ages 3–6) are also increasingly using them. Parenting styles play a crucial role in regulating gadget use. The appeal of technology in gadgets often allows preschoolers to operate them independently. Children become comfortable with gadgets due to their engaging features, interactive applications, and flexibility (Sunita & Mayasari, 2018). These attractive variations can lead to gadget addiction, wherein children develop a persistent desire to play with gadgets. When denied access, they may cry or exhibit frustration. This behavior disrupts their social interactions and makes them reluctant to engage in other activities (Dewi, 2020).

In 2013, the World Health Organization (WHO) identified Internet Gaming Disorder (IGD) as part of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5). By 2018, Gaming Disorder was also included in the *International Classification of Diseases* (ICD)

(Darvesh et al., 2020). Gaming Disorder affects a small fraction of individuals who engage in digital or video gaming. However, gamers should monitor their gaming time, especially if it interferes with daily activities or leads to physical, psychological, or social dysfunction (WHO, 2022). As of March 2021, Indonesia had 212.35 million internet users, ranking third in Asia for internet usage (Kusnandar, 2021). A Google survey using its Consumer Barometer tool revealed that smartphone users in Indonesia had increased by 43%. Compared to the previous year, where smartphone penetration was at 22%, this represents nearly a twofold increase (Warisyah, 2019). In January 2021, internet users in Indonesia reached 202.6 million, marking a 1.03% increase from the previous year. Over the past five years, internet usage in Indonesia has surged by 54.25%, with 132.7 million users recorded in 2018 (Nurfitri et al., 2023).

Gadget use in children has both positive and negative impacts. Positively, gadgets can enhance creativity and intelligence. Negatively, they affect psychological and physical health (Eklesia et al., 2020). Adverse effects include decreased concentration, poor emotional regulation, and health problems (Wahyuningtyas et al., 2022). Generation Z, unable to spend a day without gadgets, views them as essential tools for daily living. Parents often use gadgets to manage their children's behavior in public, perceiving them as necessary in modern life. However, parents frequently neglect their responsibility to weigh the pros and cons of providing gadgets to their children, as their impact can be harmful or beneficial depending on how they are used (Zain et al., 2022). While gadgets can foster creativity through interactive applications, excessive use can lead to dependence and addiction without proper parental guidance (Sarvananthan, 2015).

One significant consequence of gadget addiction is the disruption of sleep quality and quantity in adolescents (Jarmi & Rahayuningsih, 2017; Kanti NF, 2020; Keswara et al., 2019). Some studies, however, indicate no association between gadget use and sleep quantity, though it does affect sleep quality (Hablaini et al., 2020). Prolonged smartphone use delays sleep onset by approximately 60 minutes, causing adolescents to sleep later than usual. The sophistication and convenience of smartphones trap many users into constant engagement (Mawitjere et al., 2017). Poor sleep quality due to excessive gadget use also correlates with declining academic performance (Mawitjere et al., 2017; Muliani & Widjaja, 2022; Putra, 2022), potentially linked to insufficient sleep quality and quantity (Aminuddin, 2020; Sonda et al., 2021).

Observations in the Pidie Regency community reveal frequent instances of teenagers, preschoolers, and toddlers playing with smartphones. Interviews with parents indicate that children habitually use gadgets while eating, before studying, and even during family gatherings. Parents also report that their children prefer gadgets over sleeping, with some experiencing a decline in academic performance. Despite this, parents often hesitate to restrict gadget use as gadgets are also deemed essential for daily activities. Previous research shows that 80% of surveyed respondents are internet (gadget) users, highlighting a digital divide between urban, affluent areas and rural, less affluent regions of Indonesia (A. P. Sari et al., 2017). Nonetheless, some studies have found no relationship between gadget addiction and sleep quality. This study aims to analyze the relationship between gadget addiction, sleep quality, and academic performance among adolescents.

METHOD

The study design employed a cross-sectional approach to analyze the relationship between gadget addiction, sleep quality, and academic performance among adolescents in coastal and mountainous areas of Pidie Regency. The research is planned to be conducted in two high

schools located in the Pidie Regency: SMA Kembang Tanjong, representing the coastal area, and SMAN Tangse, representing the mountainous area. These two schools were selected to facilitate a comparison between two distinct geographical regions. The study population consisted of all adolescents residing in the Pidie Regency. The sample included adolescents aged 15–18 years who attend high schools in the coastal and mountainous areas of the regency. The inclusion criteria required respondents to be students at the designated high schools, willing to participate, and not experiencing illness. The total sample size for this study included 337 students from SMA Kembang Tanjong and 159 students from SMAN Tangse. The sampling method employed was total sampling.

The study utilized primary data collected directly from the field through questionnaires distributed to the parents of students at the respective schools. Data collection was assisted by eight enumerators, comprising six healthcare workers and two school representatives, who had received prior training. The instruments used in this study included, the *Smartphone Addiction Scale-Short Version* (SAS-SV) to measure gadget addiction, the *Pittsburgh Sleep Quality Index* (PSQI) to assess sleep quality, the *Zung Self-rating Anxiety Scale* (ZSAS) to evaluate anxiety levels, and the *Children's Depression Inventory* (CDI) to measure depression. Data analysis was conducted to test hypotheses and determine relationships between independent and dependent variables using the Mann-Whitney U test and linear regression.

RESULT

Tabel 1.
Distribution of Respondents by Region

Region	f	%
Coast	337	67,94
Mountains	159	32,06

Table 2.
Differences in average gadget addiction, sleep quality, and achievement index between coastal and mountainous areas in Pidie Regency (Mann Whitney Test)

Variables	Region	Rank Sum	p-values
Gadget Addiction	Coast	81583	0,1467
	Mountains	41673	
Sleep Quality	Coast	82853	0,5471
	Mountains	40403	
Grade Point	Coast	66182,5	0,0000
	Mountains	57073,5	

Table 1, it shows that 67.94% of respondents live in coastal areas and 32.06% live in mountainous areas. Based on Table 2. shows no significant difference between the average gadget addiction in coastal areas and mountainous areas (p-value = 0.1467). Likewise with sleep quality which shows no significant difference between coastal areas and mountainous areas (p-value = 0.5471). However, the results of the study showed a significant difference between the achievement index of respondents in coastal areas and mountainous areas (p-value = 0.0000).

Based on Table 3, shows the characteristic factors related to sleep quality in respondents in Pidie Regency, namely age (coef = 0.32; 95%CI = 0.07 - 0.68; p-value = 0.014) and male gender (coef = 0.77; 95%CI = 0.20 - 1.33; p-value = 0.007). Every 1 year increase in the respondent's age increases the sleep quality score by 0.32. Respondents who are male are at risk of increasing their sleep quality score by 0.77. Parental characteristic factors related to

sleep quality in respondents in Pidie Regency are elementary maternal education (coef = 1.58; 95%CI = 0.37 - 2.78; p-value = 0.010). Respondents whose mothers have elementary education are at risk of increasing their sleep quality score by 1.58. Gadget addiction-related factors related to sleep quality in respondents in Pidie Regency are gadget addiction (coefficient = 0.10; 95%CI = 0.006 – 0.03; p-value = 0.002). Every 1 increase in gadget addiction score increases 0.10 sleep quality scores. Mental health factors related to sleep quality in respondents in Pidie Regency are anxiety (coefficient = 0.04; 95%CI = 0.02 – 0.07; p-value = 0.000). Every 1 increase in anxiety score increases 0.04 sleep quality scores.

Table 3.

Relationship between respondent characteristic factors, parent characteristics, gadget use related factors and mental health factors with sleep quality based on Region (Linear Regression Test)

Wilayah	Total (n = 496)		Coast (n = 337)		Mountains (n=159)	
	Koef (95%CI)	p-value	Koef (95%CI)	p-value	Koef (95%CI)	p-value
Respondent Characteristic Factors						
Age, years	0,37 (0,07 – 0,68)	0,014	0,41 (-0,16 – 0,99)	0,160	0,36 (0,02 – 0,71)	0,038
Gender						
Female						
Male	0,77 (0,20 – 1,33)	0,007	0,80 (0,11 – 1,50)	0,023	0,69 (-0,27 – 1,66)	0,158
Parental Characteristics Factors						
Mother's Education						
High						
Middle	0,99 (-0,23 – 2,23)	0,114	1,13 (-0,38 – 2,64)	0,142	0,71 (-1,46 – 2,88)	0,519
Primary	1,58 (0,37 – 2,78)	0,010	1,49 (0,02 – 2,97)	0,047	1,76 (-0,36 – 3,88)	0,104
No School	-0,25 (-2,46 – 1,95)	0,823	-0,42 (-3,22 – 2,36)	0,763	0,05 (-3,59 – 3,70)	0,976
Mother's Occupation						
Working						
Not Working	0,21 (-0,35 – 0,78)	0,451	-0,15 (-0,85 – 0,54)	0,661	1,07 (0,08 – 2,06)	0,033
Father's Education						
High						
Middle	0,14 (-1,65 – 1,95)	0,871	-0,973 (-2,42 –	0,951	0,33 (-2,48 – 3,14)	0,817
Primary	0,43 (-1,35 – 2,23)	0,634	2,27)	0,890	1,45 (-1,32 – 4,23)	0,302
No School	1,31 (-0,85 – 3,49)	0,235	-0,16 (-2,46 – 2,17)	0,693	2,65 (-0,79 – 6,09)	0,131
			0,56 (-2,23 – 3,35)			
Father's Job						
Working						
Not Working	0,82 (-0,38 – 2,03)	0,180	-0,26 (-1,86 – 1,34)	0,747	2,40 (0,59 – 4,22)	0,009
Revenue, Rupiah	-1,37 (-4,17 – 1,44)	0,340	-1,17 (-4,79 – 2,45)	0,526	-1,71 (-6,17 – 2,76)	0,451
Factors Related to Gadget Usage						
Gadget Addiction, score	0,10 (0,006 – 0,03)	0,002	0,10 (0,00 – 0,02)	0,046	0,02 (0,005 – 0,04)	0,012
Social Media Motive						
None						
Yes	0,63 (-0,00 – 1,26)	0,051	0,44 (-0,34 – 1,24)	0,269	0,99 (-0,06 – 2,05)	0,065
Motives for Playing Games						
None						
Yes	0,30 (-0,30 – 0,90)	0,328	-0,25 (-0,49 – 1,01)	0,500	0,38 (-0,63 – 1,40)	0,457
Ease of Access Gadget						
Difficult	-0,11 (-0,68 –					
Easy	0,45)	0,686	0,14 (-0,56 – 0,84)	0,694	-0,67 (-1,65 – 0,30)	0,174
Duration of Gadget Usage, Minutes	0,0003 (-0,001 – 0,002)	0,737	-0,0005 (-0,003 – 0,002)	0,724	0,002 (-0,001 – 0,006)	0,220
Mental Health Factors						
Depression, Score	0,001 (-0,03 – 0,03)	0,907	0,008 (-0,03 – 0,40)	0,689	-0,01 (-0,06 – 0,04)	0,680
Anxiety, Score	0,04 (0,02 – 0,07)	0,000	0,03 (0,007 – 0,06)	0,014	0,08 (0,04 – 0,13)	0,000

Based on Table 4, shows the characteristic factors related to the achievement index of respondents in Pidie Regency, namely male gender (coefficient = -2.07; 95% CI = -2.55 - -1.60; p-value = 0.000). Respondents who are male are at risk of lowering the achievement index value by 2.07. The results of the statistical test analysis showed that there were no

significant parental characteristic factors related to the achievement index of respondents in Pidie Regency. Factors related to gadget addiction related to the achievement index of respondents in Pidie Regency are gadget addiction (coef = 0.01; 95%CI = 0.002 - 0.02; p-value = 0.018), social media motives (coef = -0.67; 95%CI = -1.23 - -0.10; p-value = 0.021), easy access to gadgets (coef = 1.04; 95%CI = 0.54 - 1.54; p-value = 0.000). Every 1 increase in gadget addiction score increases the achievement index value by 0.01. Respondents who use gadgets for social media are at risk of decreasing the achievement index value by 0.67. Respondents who easily access gadgets are at risk of increasing the achievement index value by 1.04. Mental health factors related to the achievement index of respondents in Pidie Regency are depression (coef = 0.05; 95%CI = 0.03 - 0.08; p-value = 0.000) and anxiety (coef = -0.04; 95%CI = -0.6 - -0.02; p-value = 0.000). Every 1 increase in depression score increases the achievement index value by 0.05. Every 1 increase in anxiety score decreases the achievement index value by 0.04.

Table 4.
Relationship between respondent characteristic factors, parent characteristics, factors related to gadget use and mental health factors with achievement index based on Region (Linear Regression Test)

Region	Total (n = 496)		Coast (n = 337)		Mountains (n=159)	
	Koef (95%CI)	p-value	Koef (95%CI)	p-value	Koef (95%CI)	p-value
Respondent Characteristic Factors						
Age, years	0,22 (-0,04 – 0,49)	0,106	0,66 (0,24 – 1,07)	0,002	0,18 (-0,10 – 0,47)	0,206
Gender						
Female						
Male	-2,07 (-2,55 – -1,60)	0,000)	-2,42 (-2,85 – -1,98)	0,000	-1,52 (-2,30 – -0,75)	0,000
Parental Characteristics Factors						
Mother's Education						
High						
Middle	-0.44 (-1,56 – 0,66)	0,430	0,01 (-1,08 – 1,11)	0,980	-1,74 (-3,55 – 0,06)	0,059
Primary	-0,57 (-1,66 – 0,51)	0,297	-0,37 (-1,44 – 0,69)	0,494	-1,27 (-3,04 – 0,49)	0,155
No School	-0,18 (-2,18 – 1,80)	0,853	-0,87 (-2,90 – 1,16)	0,400	0,23 (-2,80 – 3,27)	0,878
Mother's Occupation						
Working						
Not Working	-0,08 (-0,60 – 0,42)	0,733	0,11 (-0,39 – 0,62)	0,302	0,43 (-0,39 – 1,27)	0,302
Father's Education						
High						
Middle	-0,03 (-1,66 – 1,58)	0,965	0,31 (-1,37 – 2,01)	0,712	0,60 (-2,32 – 2,46)	0,955
Primary	-0,08(-1,69 – 1,52)	0,916	-0,04 (-1,73 – 1,63)	0,955	0,31 (-2,05 – 2,68)	0,793
No School	-0,33 (-2,29 – 1,61)	0,734	-0,70 (2,72 – 1,31)	0,492	0,87 (-2,05 – 3,80)	0,556
Father's Job						
Working						
Not Working	0,13 (-0,94 – 1,21)	0,805	-0,92 (-2,08 – 0,23)	0,118	0,87 (-0,65 – 2,39)	0,262
Revenue, Rupiah	5,65 (-1,95 – 3,08)	0,659	5,89 (-2,04 – 3,22)	0,659	-1,07 (-4,78 – 2,65)	0,571
Factors Related to Gadget Usage						
Gadget Addiction, score	0,01 (0,002 – 0,02)	0,018	0,01 (0,007 – 0,02)	0,001	-0,01 (-0,02 – 0,006)	0,231
Social Media Motive						
None						
Yes	-0,67 (-1,23 – -0,10)	0,021	-0,72 (-1,30 - -0,15)	0,013	-0,19 (-1,08 – 0,69)	0,669
Motives for Playing Games						
None						
Yes	-0,46 (-1,01 – 0,07)	0,089	-0,49 (-1,03 – 0,05)	0,079	-0,79 (-1,63 – 0,04)	0,064
Ease of Access Gadget						
Difficult						
Easy	1,04 (0,54 – 1,54)	0,000	1,27 (0,78 – 1,77)	0,000	-0,52 (-1,33 – 0,28)	0,202
Duration of Gadget Usage, Minutes	0,001 (-0,008 – 0,003)	0,249	0,0008 (-0,001 – 0,002)	0,430	0,002 (-0,0007 – 0,006)	0,124
Mental Health Factors						
Depression, Score	0,05 (0,03 – 0,08)	0,000	0,05 (0,02 – 0,08)	0,000	0,003 (-0,04 – 0,04)	0,886
Anxiety, Score	-0,04 (-0,6 – -0,02)	0,000	-0,02b (-0,04 – -0,002)	0,027	-0,02 (-0,06 – 0,01)	0,186

DISCUSSION

Differences in Average Gadget Addiction, Sleep Quality, and Achievement Index between Coastal and Mountainous Areas

The study results indicate no significant difference in gadget addiction scores between adolescents in coastal and mountainous regions. This finding contrasts with the study by Handayani et al. (2021), which suggested that the environment is one of the factors influencing gadget addiction. A study conducted in Pakistan reported that 97% of students in rural mountainous areas owned mobile phones, demonstrating that rural mountainous areas do not hinder students from accessing and using smartphones for educational purposes, safety, and security (Rahim et al., 2020). Geographical differences, such as coastal and mountainous areas, can create disparities in technology accessibility. Coastal areas may offer greater access to technological resources, while mountainous areas might face access limitations. However, the current study revealed no differences, likely because internet access is now widely available in both coastal and mountainous regions. Additionally, Wi-Fi is commonly available in most coffee shops, making it easier for adolescents to access their smartphones.

The study also found no significant difference in sleep quality between adolescents in coastal and mountainous regions. According to Billings et al. (2020), environmental factors such as population density, noise, air pollution, temperature, and social environment (safety and stigma) can affect sleep quality. However, this study found no differences in sleep quality scores among adolescents living in mountainous or coastal areas. SMA Kembang Tanjong, located in the coastal area, is far from the national highway, avoiding noise pollution. Similarly, SMA Tangse, situated in a mid-mountain area away from urban centers, also experiences minimal noise. Moreover, the cool temperatures in these regions likely contributed to the lack of differences in sleep quality between the two areas. The study results did, however, show differences in academic performance indices between the two regions. Adolescents in mountainous areas scored higher on average compared to those in coastal regions. The higher academic performance in mountainous areas may be associated with greater comfort during the learning process. According to Mendell & Heath (2005), there is a positive relationship between room quality (including thermal conditions) and student achievement. Yunita et al. (2018) noted that mountainous regions tend to have lower temperatures due to the altitude of the schools and surrounding environmental conditions. The researchers also assumed that education in SMA Kembang Tanjong in the coastal area might be slightly more challenging than in SMA Tangse, leading to higher average scores among adolescents in mountainous areas. While both schools adhere to the government-mandated curriculum, extracurricular activities in SMA Kembang Tanjong appear more demanding than those in SMA Tangse. Additionally, the number of students affects the average scores. A small number of high-achieving adolescents often prefer enrolling in more prestigious schools, which may influence these findings.

Relationship between Respondent Characteristics, Parent Characteristics, Gadget Use-Related Factors and Mental Health Factors with Sleep Quality

The study results indicate a relationship between gadget addiction and sleep quality among adolescents, both in coastal and mountainous regions. The higher the gadget addiction score, the poorer the sleep quality score. Adolescents with high gadget addiction scores are at a greater risk of experiencing poor sleep quality, with a stronger effect observed in coastal areas (coefficient = 0.10) compared to mountainous areas (coefficient = 0.02). This finding aligns with research by Tanzil & Dewanto (2023), which demonstrated a correlation between gadget addiction and sleep quality among middle and high school students at Hillcrest School. Similarly, Yulianti (2023) found a significant relationship between gadget addiction and sleep quality. Poor sleep quality was significantly more frequent among students addicted to

gadgets compared to their peers (Ozcan & Acimis, 2021). Smartphone addiction is associated with poor sleep quality, and excessive smartphone use is linked to poor sleep among university students (Rathakrishnan et al., 2021). Exposure to blue light at night disrupts the body's biological clock as it inhibits the brain's production of melatonin, a hormone that facilitates sleep (Rathakrishnan et al., 2019). According to Keswara et al. (2019), gadget use is also associated with adolescents' sleep quality. Excessive gadget use negatively impacts sleep quality (Aswar & Erviana, 2020). Most adolescents with poor sleep quality in this study reported using gadgets for more than four hours daily, with an average sleep duration of less than five to six hours per night. However, in this study, the duration of gadget use was not significantly associated with sleep quality. Nonetheless, each additional minute of gadget use slightly worsened sleep quality scores.

An individual may spend substantial time (six hours or more daily) using a smartphone for productive purposes such as work, study, or socialization, which may not necessarily lead to functional or serious disturbances (Elhai et al., 2019). However, the study found that most adolescents primarily used gadgets to access social media, and a significant number used them for gaming. Predominantly, gadgets were used for social media access (Kanti NF, 2020), which can also harm sleep quality. Gadget addiction can also trigger stress, which negatively impacts sleep quality (Sanusi et al., 2022). Consistent with this study's findings, anxiety and stress were found to increase the likelihood of poor sleep quality scores. This aligns with the research by Fauziyah & Aretha (2021), which established a relationship between stress, anxiety, and poor sleep quality. This study identified certain demographic factors associated with sleep quality in both coastal and mountainous regions, particularly female gender. This finding is consistent with Tanzil & Dewanto (2023) study at Hillcrest School. Females are more prone to sleep disturbances during hormonal changes, including menstruation, pregnancy, and menopause (Dorsey et al., 2021). Progesterone and estrogen hormones have receptors in the hypothalamus, which directly affect circadian rhythms and sleep patterns, increasing the risk of poor sleep quality in women. Psychosocial factors, such as heightened anxiety and emotional stress in women, reduce estrogen levels, thereby contributing to poor sleep quality (Fitri et al., 2021). The researchers concluded that factors associated with sleep quality include gadget addiction, anxiety, age, and gender. Adolescents addicted to gadgets often spend their leisure time using their phones, even sacrificing sleep hours to continue using them.

Relationship between Respondent Characteristics Factors, Parent Characteristics, Gadget Use Related Factors and Mental Health Factors with Achievement Index

The study results indicate a relationship between gadget addiction and adolescents' academic performance. However, the statistical significance of this relationship was observed only in coastal areas, while no such relationship was found in mountainous regions. This finding aligns with Rathakrishnan et al. (2021) study, which states that higher smartphone addiction levels correlate with lower academic achievement. The frequency of students using their gadgets can influence their learning process. Both low and high levels of gadget usage intensity can impact academic outcomes. Excessive gadget use often results in negative effects, such as addiction, neglect of school obligations, and reduced study time. Students who frequently use gadgets tend to have lower academic performance, while those with low gadget usage tend to perform better academically (Fitria, 2019).

On the other hand, gadget use can enhance adolescents' knowledge. Gadgets enable students to access a wide range of information, including study materials related to their school curriculum. This allows them to supplement their learning, particularly for topics not thoroughly covered in class. Thus, gadget use is a significant factor influencing students'

academic performance (Fitria, 2019). Other factors related to academic performance include anxiety, depression, social media use, ease of gadget access, and gender. Adolescents experiencing anxiety tend to have lower academic performance. This finding is consistent with research by Hasibuan & Riyandi (2019), which showed that higher anxiety levels negatively affect academic performance. Increased anxiety among students correlates with lower academic achievement (Kusumastuti, 2020). Playing games also negatively impacts adolescents' academic performance. According to Sirait et al. (2019), the intensity of online gaming or addiction to online games is negatively correlated with students' academic performance. The negative correlation suggests that the more time students spend playing online games, or the higher their level of gaming addiction, the poorer their academic outcomes. The heavy workload, numerous assignments, and challenging exams often contribute to study-related anxiety among students. This anxiety, when not properly managed, ultimately affects their academic performance (Kusumastuti, 2020). Additionally, gender is linked to academic performance, with males showing lower performance levels compared to females. This difference may stem from varying learning styles between genders, where the education system may be more aligned with one gender's learning preferences. Females might also face greater pressure or higher expectations to succeed academically, which could influence their performance outcomes.

CONCLUSION

Factors associated with sleep quality include age (coef = 0.32; 95% CI = 0.07–0.68; p-value = 0.014), male gender (coef = 0.77; 95% CI = 0.20–1.33; p-value = 0.007), mother's basic education (coef = 1.58; 95% CI = 0.37–2.78; p-value = 0.010), gadget addiction (coef = 0.10; 95% CI = 0.006–0.03; p-value = 0.002), and anxiety (coef = 0.04; 95% CI = 0.02–0.07; p-value = 0.000). Factors associated with academic performance include male gender (coef = -2.07; 95% CI = -2.55–-1.60; p-value = 0.000), gadget addiction (coef = 0.01; 95% CI = 0.002–0.02; p-value = 0.018), social media motives (coef = -0.67; 95% CI = -1.23–-0.10; p-value = 0.021), ease of gadget access (coef = 1.04; 95% CI = 0.54–1.54; p-value = 0.000), depression (coef = 0.05; 95% CI = 0.03–0.08; p-value = 0.000), and anxiety (coef = -0.04; 95% CI = -0.6–-0.02; p-value = 0.000). Adolescents are encouraged to reduce gadget usage as it negatively affects both sleep quality and academic performance. Instead, they can replace gadget-related activities with positive alternatives such as engaging in physical activities, playing sports, socializing with peers, studying together, or other constructive activities. Furthermore, parents are advised to monitor their children's gadget use closely to prevent addiction.

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