

**Association between Screentime of Gadget Used and Eye Strain in School-Age Children****Sopiatul Laila^{1*}, Casman Casman^{1*}, Rahmitha Sari¹, Nastiti Az Zahra², Bahtiar Bahtiar³**

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*Correspondence: Casman Casman | Sultan Ageng Tirtayasa University | casman@untirta.ac.id**Abstract**

Introduction: Technological advancements have made gadgets an integral part of daily life and children's education. However, excessive gadget use can have negative effects on eye health, one of which is eye strain (asthenopia). This study aims to analyze the relationship between the intensity of gadget use and eye strain among students at SMPN 19 in Serang City.

Method: This quantitative study employed a cross-sectional design. The study population consisted of all 583 students in grades 7–9 SMPN 19 in Serang City. The sample consisted of 237 students selected using stratified random sampling with proportional allocation. Data collection took place from September to November 2025 using a questionnaire that had been validated for both validity and reliability. Bivariate analysis employed Spearman's rho correlation test because the data for the eye strain variable were not normally distributed.

Results: Respondents had a median gadget usage of 480 minutes/day (8 hours/day, range: 20–900 minutes) and a median eye strain score of 25 (range: 14–44), indicating a high level of eye strain among students (median > 15). The results of the Spearman's rho test showed a statistically significant association between gadget usage intensity and eye strain ($p = 0.004$; $r = -0.186$).

Conclusion: There is a significant association between gadget usage intensity and eye strain among middle school students. The high duration of gadget used and high eye strain scores underscore the importance of eye health education in schools. Further research is recommended to evaluate other contributing factors such as viewing distance, room lighting, and body position/posture while using gadgets.

Keywords: Adolescents, Children, Eye Strain, Gadgets, Screentime, School-Age

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INTRODUCTION

Technological advancements are deeply intertwined with human life today. Gadgets are one example; they are designed with specific functions to simplify work and daily activities and now feature modern capabilities that enhance efficiency and productivity. This has made gadgets an integral part of personal, social, and educational life (Gayatri et al., 2020). Gadget users require internet access. Nationally, 28.53% of internet users are children and adolescents. Nearly 98% of internet users in Banten are in the 13–24 age group, indicating a highly active digital ecosystem. On average, 65% of adolescents actively use the internet for learning and entertainment (Badan Pusat Statistik, 2024).

Excessive gadget use can have negative effects on children's growth and development (Tiwi et al., 2024). Physically, prolonged gadget use can lead to eye strain and even a decline in visual acuity. Symptoms of eye strain typically include a burning sensation, itching, red eyes, pain, heavy eyelids, and headaches (Gayatri et al., 2020). A previous cross-sectional study of 160 school students showed that the intensity of gadget use significantly affects eye fatigue ($p=0.020$). 41.5% of students used gadgets for too long, and 58.5% had poor eye health (Herlina et al., 2025).

A preliminary survey conducted on September 24, 2025, at Serang City Public Junior High School No. 19, located in Walantaka District and with approximately 583 students, revealed a high rate of gadget use for learning, communication, and entertainment. Based on interviews with teachers and five members of the Student Council, it was found that the majority of students in grades 7–9 frequently experienced symptoms such as eye pain, watery eyes, dizziness, and

blurred vision after prolonged gadget use. This condition is exacerbated by students' habit of using gadgets at night under inadequate lighting and at close range, as well as social factors such as the pressure to remain active in online games or on social media. Based on the interview results, it can be concluded that a phenomenon relevant to the focus of this study exists at SMPN 19 in Serang City. Based on the background described above, the objective of this study is to analyze the relationship between the intensity of gadget use and eye strain among students at SMPN 19 in Serang City.

METHOD

This quantitative study employed a cross-sectional design. The study population consisted of 583 students in grades 7–9 at SMPN 19 in Serang City. The sample size was determined to be 237 students using a proportional allocation formula. Sampling was conducted using stratified random sampling with proportional allocation to ensure balanced representation across each grade level. The sample sizes for each grade were as follows: 78 students in Grade VII, 76 students in Grade VIII, and 84 students in Grade IX. The study was conducted from September to November 2025. Data were collected using a questionnaire.

The gadget usage intensity questionnaire asked how many minutes per day students spent using gadgets (Tiwi et al., 2024). The eye strain questionnaire underwent validity and reliability testing involving 13 students from SMP 19 in Serang City, Respondent for VR test is not from 237 respondent for analysis data. The results of the Pearson Product-Moment correlation test at a 5% significance level showed that all questions were valid (smallest $r = 0.593 > 0.553$), with a Cronbach's Alpha value of 0.738. Categorical data are presented as frequency distributions, and numerical data are presented as medians and minimum and maximum values. Bivariate data were analyzed using Spearman's rho correlation test because, based on the normality test, the data were not normally distributed. The Z-skewness test yielded a value of -2.87398, which falls within the ± 2 range and can be considered normally distributed. Meanwhile, the eye fatigue variable had a Z-skewness value of 3.57, which falls outside the ± 2 range; therefore, the data is not normally distributed.

RESULTS

The majority of the respondents in this study were female, aged 12–15 years. The average daily gadget usage was 8 hours, and the median eye strain score was 25.

Table 1. Respondent Characteristics (n=237)	
Characteristics	Results
Age (median;min-max)	13;12-15
Sex (n;%)	
Female	127;53.6
Male	110;46.4
Screentime of Gadget Used (median;min-max)	480;20-900
Eye strain (median;min-max)	25;14-44

The results of the Spearman's rho correlation test showed a p-value of 0.004 ($p < 0.05$) with a correlation coefficient of $r = -0.186$, indicating a statistically significant relationship of weak strength and negative direction; thus, an increase in the intensity of gadget use tends to be followed by a change in the level of eye strain, with a low strength of association.

Table 2. Association between Screentime of Gadget Used and Eye Strain (n=237)				
Variable	Result			
	Median	Min-Max	p Value	r
Intensity of Gadget use	480	20-900	0.004	-0.186
Eye Strain	25	14-44		

DISCUSSION

Based on the results of a study conducted at SMPN 19 Serang City in 2025, it was found that the median age of the respondents was 13 years. The students are already in their teenage years, and teenagers tend to use gadgets for fun or entertainment (Kalsum et al., 2025). More than half of the respondents were female. Girls spend more time using gadgets because they tend to use the features available on gadgets to connect with many people through social media and use various entertainment apps (Laoli, 2022).

Based on the results of this study, each student uses gadgets for at least 2 hours a day. This exceeds the recommended limit; children should use gadgets for no more than 2 hours a day (Tiwi et al., 2024). This aligns with the finding that eye strain was present at a median score of 25. This figure is very high, as a score of 15 is already considered indicative of eye strain. The results of the Spearman's rho test also indicate a significant correlation between the intensity of gadget use and eye strain among students ($p < 0.05$).

Eye strain caused by prolonged use of electronic devices is hard to avoid when teenagers are required to study online (Ratih, 2022). Eye strain, commonly known as asthenopia, is a condition that occurs when the eyes are used for too long or too intensely. Activities that require sustained visual focus, such as looking at gadget screens, are the primary cause (Nasyahadila et al., 2022). The findings of this study align with a previous study conducted on 97 participants regarding the relationship between gadget usage intensity and eye strain at SMP Negeri 2 Samarinda. The results of that study yielded a p-value of 0.038 ($p\text{-value} < 0.05$, so H_0 was rejected and H_1 accepted, indicating a relationship between the duration of gadget use and visual acuity among early adolescents at SMP Negeri 2 Samarinda (Kalsum et al., 2025).

This study indicates that students—especially those in their early teens—tend to use gadgets excessively; some students use gadgets for more than 8 hours a day, with a median of 2 hours daily. This results in a very high percentage of eye strain among students, with scores 10 points higher than the median of 25 (the standard median is 15 out of a maximum score of 30 for eye strain). Eye strain caused by excessive gadget use among the respondents in this study is certainly exacerbated by students using gadgets while sitting in an incorrect posture, improper viewing distance, lighting, and other factors.

CONCLUSION

Based on the research findings, it can be concluded that there is a statistically significant relationship between the screentime of gadget use and eye strain among students at SMPN 19 in Serang City ($p = 0.004$). Most students use gadgets far beyond the recommended daily time limit, with a median usage of 8 hours per day, which contributes to high levels of eye strain (median score of 25).

The implications of this study indicate that prolonged exposure to digital screens poses a real risk to adolescents' visual health, thus requiring integrated health promotion interventions and preventive measures within school and pediatric nursing services. To prevent further vision problems, schools and parents need to collaborate in educating students about healthy gadget usage behaviors, such as limiting screen time, applying the 20-20-20 rule, ensuring adequate room lighting, and maintaining a safe viewing distance. For future research, it is recommended to examine other environmental and behavioral factors—such as body posture, screen brightness, and refractive errors—using longitudinal or direct observational methods to gain a more comprehensive understanding of asthenopia in children.

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