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The Impact of Screen Time Duration and Eye Rest Habits on Students of Muhammadiyah 4 High School, Depok City in 2024

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ABSTRACT

Introduction: Eye fatigue is prevalent among students due to prolonged use of electronic devices like smartphones. This study aims to identify factors contributing to eye fatigue complaints at SMA Muhammadiyah 4 in Depok City, focusing on the relationship between individual, digital device, and environmental factors. **Method**: In this study, the dependent variable is eye fatigue and the independent variables are body posture when using a touch screen cell phone, eye rest, duration of screen time, screen distance, temperature and lighting level. **Results**: Based on the results of univariate analysis, it shows that 70 students (63.1%) experienced fatigue, eye rest (P-value 0.024), screen time duration (P-value 0.050), body posters using touch screen cell phones (P- value 0.013), distance from the touch screen cellphone screen (P-value > 0.834) with eye complaints. Based on bivariate results, those who did not rest their eyes (51.4%), the duration of screen time was more than > 4 hours (66.3%), inappropriate body posture for using touch screen cellphones (77.1%) and playing with the distance from the electronic device screen is < 30 cm (63.9%). **Conclusion**: Based on the research results, eye fatigue at SMA Muhammadiyah 4 Depok combination of factors such as electronic device use, study habits and school environmental factors. By understanding this correlation, schools, parents, and students can take preventive and corrective steps to reduce the risk of eye fatigue, such as regulating the duration of electronic device use, improving lighting and room design, and increasing awareness of the importance of regular eye examinations and eye health habits.

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INTRODUCTION

According to the Ministry of Health (2018), eye fatigue is a disorder that occurs in the ciliary muscle due to excessive eye use. Most high school students in Indonesia routinely use electronic devices such as smartphones and computers for learning and entertainment activities. The use of these devices has increased significantly along with technological developments and increasingly easy internet access. In addition, students are also at risk of experiencing eye strain. In the current era of globalization, students are expected to be more active in using computers, laptops, televisions, tablets, and cell phones to meet their academic and non-academic needs. In addition, tablet ownership in Indonesia has decreased, with only 6.52% of the population owning a tablet in 2017, while 93.48% did not own one (Ministry of Communication and Information of the Republic of Indonesia, 2017).

According to data from the World Health Organization (WHO, 2023), approximately 2.2 billion people worldwide experience vision problems. Of these, 1.1 billion have problems that can be corrected with glasses or contact lenses. Meanwhile, approximately 1.1 billion others experience permanent vision impairment, such as blindness. A survey by the Indonesian Internet Service Providers Association (APJII) (2022) showed that the three islands with the most internet users are Kalimantan (79.09%), Java (78.39%), and Sulawesi (75.05%). According to the Indonesian Telecommunications Statistics released by the Central Statistics Agency (BPS), West Java Province ranks sixth with 71.12% of internet users aged 5 years and above, and has the highest education level among internet users. A total of 34.53% of internet users have a high school or equivalent education, compared to 2.70% of users with a diploma (D3) and 9.16% with a bachelor's degree (S1) (BPS, 2022).

According to the Ministry of Communication and Informatics of the Republic of Indonesia (2017), high school students frequently use computers, laptops, and touchscreen mobile phones connected to the internet. This may be due to the increased learning content and assignments given to students in preparation for entering the workforce or continuing higher education. Devices such as computers and smartphones help students complete assignments, study online, communicate, and engage in social media activities.

In a global study conducted by Ranasinghe et al. (2015) on users of Video Display Terminals (VDTs) such as computers, laptops, and touchscreen mobile phones, it was found that approximately 60 million people, or 90% of them, experience eye fatigue. In Indonesia, Amalia et al. (2014) reported that the prevalence of eye fatigue complaints among students who use computers or laptops reached 92.9%. In Bangka Belitung, the proportion of high school students experiencing eye fatigue due to electronic media use was 473 out of 587 respondents, or approximately 80.6% (Wati, 2021). Research by Milhanah et al. (2015) showed that at a Samarinda vocational school, 166 of 313 respondents (53%) experienced eye strain due to computer or laptop use. Segui et al. (2015) noted various symptoms of eye fatigue, including burning, itching, excessive blinking, red eyes, pain, heavy eyelids, blurred vision, double vision, difficulty focusing, and headaches. Although eye fatigue is often considered a minor problem, its effects can lead to decreased visual ability, reduced intelligence, and decreased productivity among students (Gayatri et al., 2021).

Zanastia (2022) found that SMAN 8 South Tangerang, a high school in Banten Province, is a technology-based educational institution. The use of laptops, computers, and cell phones at the school has resulted in students experiencing problems such as red eyes, eye inflammation, a foreign body sensation, watery eyes, excessive blinking, and eye pain. These symptoms include dryness, blurred vision, double vision, difficulty focusing at close

range, sensitivity to light, distorted vision around objects, decreased visual acuity, and headaches (migraine).

SMA Muhammadiyah 4 Depok City, in 2020, already implemented online learning when the COVID-19 pandemic hit, and continues to actively utilize touchscreen computers, laptops, and cell phones as educational tools. In a preliminary study of 50 students, 15 (30%) reported experiencing eyestrain during class, with 8 students (53.3%) reporting this complaint quite frequently. Reported symptoms included headaches (40%), blurred vision (33.3%), and sore eyes (6.7%).

The impact of eye fatigue that often occurs in students includes decreased enthusiasm and productivity (Sugue, M., & Huang, M., 2024). Eye fatigue can be triggered by various factors, such as individual factors (gender, use of glasses, eye rest habits, and posture when using a touchscreen phone), digital device factors (length of screen use and the presence of anti-glare on the phone), and environmental factors (lighting levels and temperature). This indicates that students at SMA Muhammadiyah 4 Depok City, who use digital devices, are at risk of experiencing eye fatigue problems. The results of a preliminary study also showed that approximately 30% of students at the school experienced eye fatigue. No research has yet addressed this issue at SMA Muhammadiyah 4 Depok City, so this study aims to identify factors associated with eye fatigue in students at the school. The many factors that contribute to eye fatigue put students at SMA Muhammadiyah 4 Depok City, as users of computers, laptops, and touchscreen phones, at risk of experiencing this problem. In addition, the results of a preliminary study showed that approximately 30% of students at SMA Muhammadiyah 4 Depok City experienced eye fatigue. To date, no research has addressed the issue of eye fatigue in this school. Therefore, this study will be conducted to identify factors associated with eye fatigue in students at Muhammadiyah 4 Senior High School, Depok City.

LITERATURE REVIEW

Eye fatigue is a condition caused by overuse of the eye muscles (Ministry of Health, 2018). The longer a person uses digital devices, the level of discomfort they experience can increase (American Optometric Association, 2018).

According to the American Optometric Association (AOA) (2020), some of the main causes of eye fatigue are: 1. Sustained focus: Staring at a screen for extended periods forces the eye muscles to work continuously to maintain vision. 2. Reduced blink rate: A person tends to blink less when looking at a screen, causing dry eyes. 3. Exposure to blue light: Blue light from screens can damage the eyes and contribute to fatigue. 4. Too-close viewing distance: Staring at a screen from too close a distance can cause strain on the eye muscles.

Research by Agarwal et al. (2014) states that someone who uses a computer/laptop for more than 6 hours is at a greater risk of eye fatigue. Taking eye breaks involves using the 20-20-20 method, which involves moving 20 feet (6 meters) away for 20 seconds every 20 minutes (Ministry of Health, 2020).

The eyes become accustomed to seeing objects that are far away or close. This accommodative activity by the eye muscles can cause symptoms of eye fatigue due to ineffective accommodation. The Japan Ergonomics Society (2020) states that the distance between a mobile phone screen and the eyes is 30-50 cm, and that suitable indoor lighting for use with touchscreen computers, laptops, and mobile phones is 300 lux to 500 lux (Ministry of Health, 2016). This is in line with Ministerial Regulation No. 5 of 2018 concerning Occupational Safety and Health in the Workplace. This regulation regulates various related aspects, including temperature and lighting, to ensure the safety and health of workers, including teachers and students in school environments.

METHOD

According to Margono, population refers to all research objects in a study, including humans, inanimate objects, animals, plants, symptoms, test results, or events that serve as data sources with the most dominant characteristics (Hardani et al., 2020). The population in this study was all students of Muhammadiyah 4 High School, Depok City, consisting of 96 students, of which 15 students. The students were included as respondents for the preliminary study. According to Sugiyono (2019), total sampling is a sampling method in which the entire population is used as a sample. The sample in this study was 12th-grade students at Muhammadiyah 4 High School, Depok City, consisting of 96 students and 15 students within the preliminary study, making a total of 111 students. The following table shows the research variables and their categorization:

Table 1. Coding and Scoring

Dependent Variable	Coding	Scoring
Eye Fatigue Complaints	C1—C10	Tired (If the interpreted score is 27 - 53) Less Tired (If the interpreted score is 0 - 26)
Body Position Using a Touchscreen Phone	B4	1 = Female (Woman) 2 = Male (Man)
Eye rest	D1—D3	1 = No 2 = Yes
Duration of *screen time*	E1—E3	1 = No 2 = Yes
Screen Distance	F	1 = < 30 cm 2 = > 30 cm
Temperature	G	1 = 20 up toi 24 2 = 24 up toi 28
Lighting Level	H	= < 350 Lux = > 350 Lux

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The data collection technique is in the research instrument for data collection, namely questionnaires and observations using a lux meter for lighting and how to use it, as follows: make sure the lux meter is in good condition and has been calibrated, turn on the lux meter, select the appropriate measurement range, point the lux meter sensor to the light source or area to be measured, make sure the sensor is not obstructed and is in the right position, wait until the tool stabilizes the reading results and record the measurement results displayed on the screen. Then there is a thermohygramer tool for measuring temperature in a room or class. The way to use a thermohygramer is to press the button to activate the tool, then read the results displayed on the screen. Some digital thermohygrometers also have additional features such as data storage or alarms. In addition to the research instrument in data collection, there are 4 steps for data collection, namely Coding, Editing, Entry and Cleaning for steps and data analysis where there are 3, namely Univariate, Bivariate and Chi-Square Test.

RESULT AND DISCUSSION

As shown in Table 1, most students at SMA Muhammadiyah 4 Depok City experienced eye fatigue (63.1%), did not take regular eye breaks (59.5%), had prolonged screen time (88.3%), maintained inappropriate body posture (83.8%), and used devices at a distance of less than 30 cm (55.0%).

The average classroom temperature was 20.4°C, which was within the standard range recommended by the Indonesian Ministry of Health Regulation No. 2 of 2023 (20–24°C), although some measurement points exceeded the standard. The average classroom lighting level was 345.9 lux, meeting the minimum requirement of 300 lux set by Ministry of Health Regulation No. 7 of 2019. However, several areas had lighting levels below the standard, with an average minimum value of 197 lux, indicating the need for improved lighting conditions to support effective learning and visual comfort.

Tabel 2. Hasil Analisis Univariat (N = 111)

Variable	Categorical	n	%
Eye Fatigue	Tired	70	63.1
	Not Tired	41	36.9
Rest Eyes	Yes	45	40.5
	No	66	59.5
Duration of *Screen Time*	Long	98	88.3
	Not Long	13	11.7
Body Posture When Using Electronic Devices	Suitable	18	16.2
	Not Suitable	93	83.8
Electronic device screen distance	< 30 cm	61	55.0
	> 30 cm	50	45.0
Temperature	19,1 ^{0}C	Qualify	
	21,7 ^{0}C	Qualify	
	18,3 ^{0}C	Qualify	
	22,5 ^{0}C	Qualify	
Level Lighting	343,9 Lux	Qualify	
	373,5 Lux	Qualify	
	484,1 Lux	Qualify	
	539,5 Lux	Qualify	

Based on the results of univariate analysis, it shows that students who experience fatigue, namely 70 people (63.1%), Eye Rest (P-value 0.024), screen time duration (P-value 0.050), body posters of touch screen cellphone use (P-value 0.013), distance of the touch screen cellphone screen (P-value > 0.834) with eye complaints.

Overview of Eye Fatigue Complaints

Based on the results of a study of eye fatigue complaints among 111 students at Muhammadiyah 4 High School in Depok City, 70 respondents (63.1%) reported eye fatigue, with only 5 or more symptoms. Meanwhile, 41 respondents (36.9%) reported more than 5 symptoms, meaning 70 respondents fell into the eye fatigue group.

Theories related to this study include the Digital Eye Strain Questionnaire (DES-Q) and Computer Vision Syndrome (CVS). The DES-Q is an instrument used to measure complaints related to digital device use, including eye fatigue, while CVS refers to various eye and vision problems associated with long-term computer or digital device use. Both theories support the findings of this study, which indicate a high prevalence of eye fatigue complaints in students who are frequently exposed to electronic screens.

These results align with several previous studies. First, a study by Amalia et al. (2017) found that the prevalence of eye fatigue among high school students in Bandung City reached 55.3%. Key risk factors include digital device use lasting more than 3 hours per day

and excessively close viewing distances. Second, a study by Wahyu et al. (2018) in Jakarta showed a 60% prevalence of eye fatigue, with risk factors including poor lighting, inadequate viewing distance, and lack of breaks during device use. Third, research by Ahmad and Yusran (2020) showed that using digital devices for more than 2 hours without a break significantly increases the risk of eye fatigue in students.

Table 3. Bivariate Analysis Results (N = 111)

The Relationship between variables	Eye Fatigue				Total		P-value	OR (CI 95%)
	Fatigue		No-fatigue					
	n	%	n	%	N	%		
Eye Rest							0.024	1.087
Yes	39	63.9	22	36.1	64	100		(0.501 – 2.356)
No	31	62.0	19	38.0	47	100		
Duration Screen Time							0.005	3.152
Long	65	66.3	33	33.7	70	100		(0.956 – 10.394)
Not Long	5	39.5	4	61.5	41	100		
Body Position When Using a Touch Screen							0.00013	1.308
Suitable	16	22.9	2	11.1	64	100		(0.587 – 2.915)
Not Suitable	54	77.1	39	41.9	47	100		
Electronic Device Screen Distance							0.834	1.087
< 30 cm	39	63.9	22	36.1	64	100		(0.501 – 2.356)
> 30 cm	31	62.0	19	38.0	47	100		

Overall, the results of this study highlight the importance of managing digital device usage time to reduce complaints of eye fatigue in students. It is recommended that students take regular breaks when using digital devices and practice healthy visual habits to reduce the risk of eye fatigue and other related symptoms.

The Relationship Between Eye Rest and Eye Fatigue Complaints

Based on the results of the univariate study, it was found that 45 students (40.5%) had (yes) eye rest time, and 66 students (59.5%) did not have (yes) eye rest time. Based on the bivariate results of the 2024 study group of students at Muhammadiyah 4 High School in Depok, 36 respondents reported experiencing eye fatigue (not taking breaks), while 34 respondents reported experiencing eye fatigue. The chi-square test result, based on the p-value, was 0.024 (p-value ≤ 0.05), indicates a relationship between eye rest and eye fatigue complaints among students at Muhammadiyah 4 High School in Depok, 2024.

The theory associated with this study is the theory of the American Academy of Ophthalmology (AAO, 2021), which states that eye fatigue can be caused by prolonged use of digital devices without adequate rest. The AAO recommends the 20-20-20 rule to prevent eyestrain: every 20 minutes, digital device users should take a 20-second break to look at something 20 feet (about 6 meters) away. This theory emphasizes the importance of eye breaks to reduce the risk of eyestrain.

The results of this study align with several previous studies that also examined the relationship between rest habits and eye health. Amalia et al. (2017) found that the prevalence of eyestrain among high school students in Bandung City reached 55.3%. The main risk factor included prolonged use of digital devices without adequate rest. This study showed that students who did not take regular eye breaks were more susceptible to eyestrain. Furthermore, research by Santoso and Rachmawati (2018) found that taking appropriate breaks during digital device use can reduce symptoms of eyestrain among

students. Furthermore, Wahyu et al. (2018) reported that the prevalence of eyestrain was 60% in Jakarta, with risk factors including long screen time and insufficient eye rest. This study also demonstrates the importance of eye breaks to reduce complaints of eyestrain in students.

The results of this study found a significant relationship between eye rest and complaints of eye fatigue in students at Muhammadiyah 4 High School, Depok City. Students who do not take eye rest have a greater risk of experiencing eye fatigue. This finding is in line with previous research showing that adequate eye rest is crucial for preventing eye fatigue. Therefore, it is recommended that schools and parents educate students about the importance of taking regular eye rests while using electronic devices to reduce the risk of eye fatigue.

The Relationship Between Screen Time Duration and Eye Fatigue Complaints

Based on the results of the univariate study, it was found that 98 students (88.3%) used touchscreen phones for ≥ 4 hours, and 13 students (11.7%) used touchscreen phones for ≤ 4 hours. Based on the bivariate results of the 2024 study, it was found that 65 students who used touchscreen phones for ≥ 4 hours experienced eye fatigue, while 5 respondents who used touchscreen phones for ≤ 4 hours experienced eye fatigue. The chi-square test results were based on a p-value of 0.050 (p-value ≤ 0.05), indicating a relationship between screen time and eye fatigue among students at the 2024 study.

The theory related to this study is the theory from the National Institute for Occupational Safety and Health (NIOSH, 2018), which states that excessive screen time can negatively impact eye health. Prolonged screen exposure without breaks can cause eye fatigue, irritation, and visual strain. This theory emphasizes the importance of managing screen time to prevent eye fatigue.

The results of this study align with several previous studies that also examined the effect of screen time on eye health. Research by Widiastuti (2016) showed that students who spend more time in front of screens tend to experience more frequent eye health complaints. Furthermore, research by Ramadhani and Supriyadi (2020) found that prolonged gadget use can contribute to increased symptoms of eye fatigue among students. Furthermore, research by Amalia et al. (2017) found that the prevalence of eye fatigue among high school students in Bandung City reached 55.3%. The main risk factor included using digital devices for more than 3 hours per day. This study indicates that prolonged screen time increases the risk of eye fatigue.

The results of this study found a significant relationship between screen time and complaints of eye fatigue in students at Muhammadiyah 4 High School in Depok City. Students with prolonged screen time (>4 hours) had a greater risk of eye fatigue than those with shorter screen time. This finding aligns with previous research showing that excessive screen time can cause eye fatigue. Therefore, it is recommended that students limit the duration of use of electronic devices and take regular breaks to reduce the risk of eye fatigue.

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The Relationship Between Touchscreen Distance and Eye Fatigue Complaints

Based on the results of univariate research, it was found that 61 respondents (55.0%) played touchscreen phones with a screen distance of ≤ 30 cm, while 50 people (45.0%) played touchscreen phones with a screen distance of ≥ 30 cm. Based on the bivariate results on students of Muhammadiyah 4 High School, Depok City in 2024, it was found that students who played touchscreen phones with a screen distance of ≤ 30 cm, as many as 39 respondents experienced complaints of eye fatigue, while respondents who played

touchscreen phones with a screen distance of ≥ 30 cm were 31 respondents. Chi-Square results based on P-value 0.834 (Pvalue ≤ 0.05). This means there is no relationship between screen time and eye fatigue symptoms among students at Muhammadiyah 4 High School in Depok City in 2024.

The theory behind this study is that of the American Academy of Ophthalmology (AAO, 2021), which states that too close a viewing distance when using digital devices can cause eye strain and increase the risk of eye fatigue. The AAO recommends maintaining a minimum viewing distance of 30 cm (approximately 12 inches) to prevent eye fatigue.

These findings align with several previous studies that have also examined the impact of screen distance on health. A study by Handayani (2016) revealed that students who use screens at close range are more likely to experience symptoms of eye fatigue. Furthermore, a study by Wahyu et al. (2018) reported that inappropriate viewing distance, including using digital devices too close, contributes to a 60% prevalence of eye fatigue in Jakarta. Another study by Cahyadi (2021) highlighted that education regarding the ideal screen distance can contribute to reducing symptoms experienced by electronic device users.

The results of this study found no significant relationship between the distance of the touchscreen of a mobile phone and complaints of eye fatigue in students at SMA Muhammadiyah 4, Depok City. This finding differs from several previous studies that suggest that viewing distances that are too close can increase the risk of eye fatigue. Therefore, although these results do not show a significant relationship, it is still recommended that students maintain a safe viewing distance when using mobile phones to prevent potential eye strain and eye fatigue. Further research is needed to confirm these findings and explore other factors that may contribute to eye fatigue.

The Relationship Between Temperature and Eye Fatigue Complaints

In the bivariate analysis, there were 12 temperature data points covering the range <20°C to >24°C, and 12 temperature data points in the range <18°C to >24°C. The analysis results showed a p-value of 0.000, indicating a significant relationship between environmental temperature and complaints of eye fatigue. The resulting Odds Ratio (OR) was 0.000, indicating that non-ideal temperatures contributed to increased complaints of eye fatigue in students. This underscores the importance of maintaining an appropriate environmental temperature to prevent eye fatigue.

The theory associated with this study is the learning environment theory, which emphasizes that the physical conditions of the learning environment, including temperature, can affect student comfort and concentration. Temperatures that are too cold or too hot can cause discomfort, which in turn can increase the risk of eye fatigue, especially when students use electronic devices.

These results align with several previous studies that also examined the effect of temperature on eye health. Research by Nursyam et al. (2015) showed that inappropriate temperatures can increase symptoms of eye fatigue in computer users. Furthermore, research by Rachmawati and Mardani (2018) found that optimal room temperature is crucial for preventing vision-related health problems, especially among students. Furthermore, research by Hasanah (2023) showed that a comfortable learning environment, including an ideal temperature, contributes to students' eye health.

The Indonesian Minister of Health Regulation (Permenkes) No. 2 of 2023 provides guidelines on Environmental Health Quality Standards (SBMKL), which cover various temperature aspects. Based on this regulation, adequate temperatures are <20°C and >24°C.

Therefore, this study emphasizes the importance of maintaining optimal classroom temperatures to minimize complaints of eye fatigue among students. Measures such as room temperature regulation and good ventilation are crucial in creating a conducive and comfortable learning environment.

The Relationship Between Lighting Levels and Eye Fatigue Complaints

This study aims to analyze the relationship between classroom lighting levels and complaints of eye fatigue among students at Muhammadiyah 4 Senior High School in Depok City. Based on univariate data, it was identified that lighting levels in each class varied: Class XII IPA 1 had a lighting level of 428.3 lux, Class XII IPA 2 had a lighting level of 462.5 lux, Class XII IPS 1 had a lighting level of 529.2 lux, and Class XII IPS 2 had a lighting level of 648.7 lux. These data indicate that Class XII IPS 2 had the highest lighting level, while Class XII IPA 1 had the lowest lighting level among the classes studied.

In the bivariate analysis, there were 12 data points with lighting levels ranging from <250 lux to >300 lux, and 12 data points with lighting levels ranging from <225 lux to >325 lux. The analysis results showed a p-value of 0.000, indicating a significant relationship between lighting levels and complaints of eye fatigue. The odds ratio (OR) obtained was 0.000, indicating that students studying in inadequate lighting conditions had a very high likelihood of experiencing eye fatigue.

The theory associated with this study is the lighting theory, which states that adequate lighting in the learning environment is crucial for supporting eye health and improving student concentration. Optimal lighting can reduce eye strain, while inadequate lighting can cause eye fatigue and decrease academic performance.

The results of this study align with several previous studies that also examined the effect of lighting levels on eye health. Research by Widiastuti and Utami (2016) showed that students studying in rooms with low lighting are more susceptible to symptoms of eye fatigue. Furthermore, research by Pratiwi et al. (2019) found that good lighting contributes to visual comfort and reduces eye strain in students. Furthermore, research by Nurhayati (2022) emphasized the importance of good lighting in classrooms to maintain students' eye health and improve their learning outcomes.

According to the Indonesian Minister of Health Regulation No. 70 of 2016 concerning School Environmental Health Standards, classroom lighting should be within the range of 250-300 lux to ensure visual comfort and prevent eye fatigue. Therefore, it is important for schools to adjust classroom lighting levels that exceed or fall below the recommended standard.

Minister of Health Regulation No. 7 of 2019 concerning Environmental Health in Buildings and the Work Environment stipulates a minimum lighting standard of 300 lux for classrooms. The study found that several locations within classrooms had lighting levels below the recommended standard. The average classroom lighting level was 250 lux. From this study, it can be concluded that lighting levels in most classrooms at SMA Muhammadiyah 4 Kota Depok exceed the recommended standard, which can negatively impact students' eye health. It is important for schools to adjust classroom lighting to meet the recommended standard (250-300 lux) to reduce the risk of eye fatigue in students.Thus, this study emphasizes the need for greater attention to classroom lighting settings to reduce eye strain complaints among students. Measures such as increasing natural light and using appropriate lighting can help create a more comfortable and healthy learning environment.

CONCLUSION

This study found that eye fatigue was experienced by 63.1% of students at SMA Muhammadiyah 4 Depok City, indicating that eye strain is a common problem among adolescents. The majority of respondents reported prolonged screen time, inappropriate viewing distances, and poor body posture while using touchscreen devices. Environmental measurements showed that classroom temperature and lighting conditions were generally within acceptable ranges.

The bivariate analysis revealed significant associations between eye fatigue complaints and rest periods, screen time duration, and body posture during touchscreen phone use. Students who did not take adequate breaks, spent longer periods using electronic devices, and maintained inappropriate postures were more likely to experience eye fatigue. In contrast, viewing distance from the touchscreen phone was not significantly associated with eye fatigue complaints.

Overall, the findings suggest that eye fatigue among students is influenced by multiple behavioral factors related to electronic device use. Therefore, preventive efforts should focus on promoting regular eye rest, limiting excessive screen time, and encouraging proper body posture during device use. Schools, parents, and students should collaborate to increase awareness of eye health and implement healthy digital habits to reduce the risk of eye fatigue and support students' well-being and academic performance.

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