

FACTORS AFFECTING VISUAL ACUITY IN ADOLESCENT GADGET USERS

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ABSTRACT

The eye is one of the senses that is very important for humans to absorb visual information. Incorrect use of gadgets, such as excessive frequency of gadget use, improper positioning, and poor lighting intensity, will have an impact on reducing visual acuity. The purpose of this study is to determine the factors that influence the occurrence of decreased visual acuity in adolescents using gadgets at SMP Negeri 2 Makassar. This study is an analytical observational study with a cross-sectional approach conducted at SMP Negeri 2 Makassar on August 22–24, 2022. The total population of seventh grade students at SMP Negeri 2 Makassar was 216. Sampling was done in this study using the random simple sampling technique, with the number of samples that meet the inclusion criteria reaching as many as 77 students. Gender obtained a p value of 0.059, the use of glasses obtained a p value of 0.334, and the type of gadget obtained a p value of 1,000. The length of playing gadgets obtained a p value of 0.000, and the position of playing gadgets had a p value of 0.415. It can be concluded that the length of use of gadgets is a factor that affects the decline in visual acuity. From the results of research on factors affecting visual acuity in adolescent gadget users at SMP Negeri 2 Makassar in 2022, it can be concluded that there is no relationship between age, gender, use of glasses, type of gadget, and position of playing gadgets with decreased visual acuity, and there is a relationship between the duration of playing gadgets > 4 hours with decreased visual acuity (p 0.000) in adolescent age children at SMP Negeri 2 Makassar. to the school to conduct routine sharp vision checks at school in collaboration with the local health center.

Keywords: *gadgets, type, length of use, position, and visual acuity.*

1. INTRODUCTION

The eye is one of the most important senses for humans to absorb visual information. However, disturbances to vision that can lead to blindness often occur, and one of the causes of blindness and poor visual acuity during activities is refractive errors (Agus & Bahri, 2017). , or "visual acuity," is the ability to distinguish small parts of detail, both on objects and on surfaces, and is one of the problems that often occur in school-age children (Hartono, 2009). In the learning process in the classroom, visual acuity becomes an important factor considering that the ratio of the classroom area to the number of

students is often inadequate. The ability to see clearly in class will affect students' understanding of lessons (Citrawati et al., 2020). Incorrect use of gadgets, such as excessive frequency of gadget use, improper positioning, and poor lighting intensity, will have an impact on reducing sharp vision (W, E, 2015). About 80–85% of the learning process relies on vision, and low vision can affect children's development, especially in skills that rely on vision. Unaddressed visual impairment will affect academic achievement and even social behavior (Citrawati et al., 2020).

Vision health problems are prevalent around the world. WHO

estimates that 36 billion people in the world lived with vision problems in 2015. Asia is said to be the region with the highest number of people with vision problems, which is spread over 3.5 million people in Southeast Asia (Flaxman, S. R., 2017). The estimated number of people with visual impairment worldwide in 2010 was 285 million, or 4.24% of the population, of which 0.58%, or 39 million, were blind and 3.65%, or 246 million, had low vision. 65% of people with visual impairment and 82% of people with blindness were aged 50 years or older (Global Data on Visual Impairment 2010, WHO 2012). According to a survey conducted by Riskerdas in 2013 and processed by the Ministry of Health's Pusdatin, the most common cause of visual impairment worldwide is uncorrected refractive error, followed by cataract and glaucoma. 18% were undetermined, and 1% were childhood visual impairments. By province, the highest prevalence of blindness in the population aged 6 years and above was found in Gorontalo (1.1%), followed by East Nusa Tenggara (1.0%), South Sulawesi, and Bangka Belitung (0.8% each). (Kemkes RI, 2013).

Vision problems are associated with several behaviors as risk factors (Jayanti et al., 2020). According to Nugraha (2018), there are several conditions that can cause a decrease in visual acuity, namely disease factors, genetic factors, age factors, environmental factors, and excessive close work activities or excessive close viewing activities (behavioral factors). Based on the results of previous studies, it was found that there are three behavioral factors when using gadgets that can affect children's visual acuity, which include the length of time using the gadget, the viewing distance when

using the gadget, and the position of the body when using the gadget (Porotu et al., 2015). (., W, E 2015)(Hidayani et al., 2020) Decreased visual acuity tends to be found in students who have close reading habits, watch television for a long duration with a close distance between the eyes and the television screen, and have the habit of using gadgets in a lying position for a long duration (Juneti et al., 2015).

Several studies on sharp vision have been conducted both abroad, such as in China, and in Indonesia, such as in Medan, Semarang, Bandung, and Bali. 5,6,7,8,9 Many of these studies were conducted on patients in hospitals and elementary school students, but not many have been conducted on adolescents in junior high school. Based on theory, the progressive decline in visual acuity occurs during puberty, including in junior high school students; therefore, this study was conducted to determine the risk factors for decreased visual acuity in adolescent gadget users at SMP Negeri 2 Makassar.

2. METHODS

This study was an analytical observational study with a cross-sectional approach conducted at SMP Negeri 2 Makassar on August 22–24, 2022. The total population of seventh grade students at SMP Negeri 2 Makassar was 216. Sampling was done in this study using the random simple sampling technique, with the number of samples that meet the inclusion criteria reaching as many as 77 students.

Sharp vision was measured by the observation method using the Snellen Chart. Students were positioned 6 meters away from the Snellen Chart and then asked to read the letters listed on the chart alternately using the right and

left eyes. Other data, such as gender, use of glasses, length of gadget use, type of gadget, and position of gadget use, were measured by the interview method using a questionnaire consisting of 9 questions. The data were analyzed univariately and bivariately to determine the risk factors for visual

impairment in junior high school students who use gadgets based on gender, use of glasses, duration of gadget use, type of gadget, and position of gadget use.

3. RESULTS

1. Characteristics of Respondents

Table 1: Frequency Distribution of Respondents Based on Age and Gender at SMP Negeri 2 Makassar

Age	Frequency	Percentage (%)
12 Years	8	10,4
13 Years	49	63,6
14 Years	18	23,4
15 Years	2	2,6
Total	77	100
Gender	Frequency	Percentage (%)
Male	42	54,5
Female	35	45,5
Total	77	100

Based on table 1 above, the results show that most students at SMP 2 Makassar are 13 years old, as many as 49 (63.6%), and most of them are male, as many as 42.2 (54.4%). percentage of frequency.

Table 2: Frequency Distribution of Respondents Based on Sharp Vision Status

Sharp vision status	Frequency	Prosentase (%)
Decreased	70	90,9
Normal	7	9.1
Total	77	100

According to the table above, for visual acuity status in class VIII students at SMP 2 Makassar, SMP Negeri 2 Makassar obtained from 77 as many as 70 students (90.9%) who have decreased visual acuity and 7 students (9.1%) who have normal vision.

2. Univariate Analysis

Table 3: Distribution of Factors Affecting the Occurrence of Decreased Visual Acuity

Glases Users	Frequency	Percentage (%)
Yes	15	19,5
No	62	80,5
Total	77	100
Length of Gadget	Frequency	Percentage (%)
≤ 4 hour	16	20,8
>4 hour	61	79,2
Total	77	100
Type of Gadget	Frequency	Percentage (%)
Mobile phone	71	92,2
Komputer tablet	6	7,8
Total	77	100
Position of Gadget Use	Frequency	Percentage (%)
Sitting	42	54,5
Sleeping	35	45,5
Total	77	100

According to the table above, there are 62 (or 80.5%) of class VIII students at SMP 2 Makassar who do not wear glasses. Eighth grade students at SMP 2 Makassar use gadgets for more than four hours 61 (79.2%), but cell phones are used by the majority of eighth grade students 71 ((92.2%). And as many as 42 (54.5%) have a habit of positioning themselves when playing gadgets with a sitting position.

3. Multivariate Analysis

Table 4 shows the factors that influence visual acuity at SMP Negeri 2 Makassar.

Variabel	Category	Vision Acuity				Total		p-value
		Decreased		Normal		N	%	
		N	%	N	%			
Age	12	7	9,0	1	1,23	8	10,4	0,334
	13	46	59,7	3	3,89	49	63,6	
	14	15	19,5	3	3,89	18	23,4	
	15	2	2,6	0	0	2	2,6	
	Total		70	90,9	7	9,01	77	
Gender	Male	29	37,7	13	16,9	42	54,5	0,059
	Female	30	38,9	5	6,5	35	45,5	
Total		59	76,6	18	23,4	77	100	
Eyeglass use	Yes	16	20,8	0	0	16	20,8	0,334
	No	54	70,1	7	9	61	79,2	
Total		70	90,9	7	9	77	100	
Gadget type	HP	64	83,1	7	9	71	92,2	1,000
	Komputer/Tablet	6	7,8	0	0	6	7,8	
Total		70	90,9	7	9	77	100	
Duration of Gadget Play	≤ 4 hour	8	10,4	8	10,4	16	20,8	0,000
	>4 hour	56	72,7	5	6,5	61	79,2	
Total		64	83,1	13	16,9	77	100	
Gadget playing position	Sitting	37	48,1	5	6,5	42	54,5	0,415
	Sleeping	33	42,9	2	2,6	35	45,5	
Total		70	90,9	7	9,1	77	100	

From the table above for age, it can be seen that with the Chi Square test, the p value of 0.334 is obtained, which means that there is no statistically significant relationship between age and sharp vision decline.

From the table above, it can be seen that, with the Chi Square test, the p value is 0.059, which means that there is no statistically significant relationship between gender and sharp vision decline.

From the table above about the use of glasses, it can be seen that the Chi Square test obtained a p value of 0.334, which means that there is no statistically significant relationship between the use of glasses and a sharp decline in vision.

From the table above about the type of gadget used, it can be seen that the Chi Square test obtained a p value of 1.000, which means that there is no statistically significant relationship between the type of gadget used and sharp vision decline.

From the table above about the length of time spent playing gadgets, it can be seen that the Chi Square test obtained a p value of 0.000, which means that there is a statistically significant relationship between the length of gadget use and sharp vision decline.

From the table above about the position of playing gadgets, it can be seen that the Chi Square test obtained a p value of 0.415, which means that there is no statistically significant relationship between the position of gadget use and sharp vision decline.

4. DISCUSSION

Based on the results of the study, 90.9% of junior high school students experienced a decrease in sharp vision, with the highest rate occurring at the age of 13 years, with 49 students (63.6%) and 46 students (59.7%) experiencing a decrease in visual acuity. This is similar to research (Jayanti et al., 2020) conducted in Karangasem Regency, which found that most of the research samples experienced a significant decrease in sharp vision, as well as research in Lanzhou City, China, which found that 90.3% of students experienced a decrease in sharp vision. However, the percentage of research results conducted by Usha et al. (2018) found only 10.2% of those with the same age range (7–15 years) experiencing a decrease in sharp vision; this is similar to the research conducted by Usha et al. (2018) (9%).

This may be due to the different age of the sample, which was 18 to 19 years old, but the students in Lanzhou City, China, were under the pressure of studying to prepare for college entrance exams, and they spent more time reading and almost no time relaxing. An explanation for this variation in prevalence is that the school in Brazil has a health clinic with eye examination facilities (Citrawati et al., 2020).

Respondents in this study were more male students than female, namely 42 people (54.5%) while female students were 35 people (45.5%), and the majority of those who suffered from decreased vision were female students, which is consistent with the findings of research conducted at

Sanglah Hospital, where it was discovered that a decrease in sharp vision was more prevalent in women, namely as many as 63% of respondents, consistent with th According to the researcher, these findings are influenced by women spending more time studying, such as close reading (Agus & Bahri, 2017), as well as factors such as outdoor activities such as exercise and leisure activities, where these activities are very supportive to stimulate the release of dopamine from the retina, which inhibits the growth of the eyeball, thereby lowering the rate of myopia in female students. in the opinion of the researcher. As previously stated, where activities carried out outdoors can minimize the occurrence of visual acuity decline and where activities carried out outdoors are known to provide indirect vitamin D intake through sun exposure so that it is very good for eye health, the more frequently a person spends time doing outdoor activities, the less chance of myopia occurrence, so it is very important for students to be able to balance daily activities with other outdoor activities (Agus & Besides that, according to Wang (re male students than female, namely 42 people (54.5%) while female students were 35 people (45.5%), and the majority who suffered from decreased vision were female students, this is in accordance with the results of research where it was found in accordance with the results of research conducted at Sanglah Hospital, where it was found that a decrease in sharp vision was more in women, namely as many as 63% of respondents, in line with the results of research (Usman, Nukman, & Bebasari, 2014) , more were female, namely 70

respondents (82.4%), while 15 respondents (17.6%) were male as well as research (Agus & Bahri, 2017) conducted at SMA SMA Sanglah.), more were female, namely 70 respondents (82.4%), while 15 respondents (17.6%) were male as well as research (Agus & Bahri, 2017) conducted at SMA Negeri 3 Banda Aceh which showed results as many as 60 respondents (70.6%) experienced myopia in the female gender and 25 male respondents (29.45) as well as research by (Musiana, et al., 2020) found that female students compared to men, 2020) found that female students compared to men, namely 24 people (54.5%) while male students were 20 people (45.5%), and the majority who suffered from myopia were female students. In the opinion of the researcher, these results are influenced by women spending more time studying, such as reading at a close distance (Agus & Bahri, 2017), besides factors such as outdoor activities such as exercise and leisure activities, where these activities are very supportive to stimulate the release of dopamine from the retina, which will inhibit the growth of the eyeball, so as to minimize the rate of myopia in students of the female gender. in the opinion of the researcher. As previously described, where activities carried out outdoors can minimize the occurrence of visual acuity decline and where activities carried out outdoors are known to provide indirect vitamin D intake by sun exposure so that it is very good for eye health, the more often a person spends time doing outdoor activities, the less chance of myopia occurrence, so it is very necessary for students to be able to balance daily

activities with other outdoor activities (Agus & Bahri, 2017). Besides that, according to Wang (2015), the age factor is one of the factors that greatly affects the rate of decline in visual acuity, where older age puts one at greater risk for decreased visual acuity compared to younger age.

The results of this study for students who use the most widely used type of gadget, namely cellphones, show that the Chi Square test obtained a p value of 1.000, which means that statistically there is no significant relationship between the type of gadget used and sharp vision decline. It is the researcher's opinion that any type of gadget used will have an impact on the decline in sharp vision. This is due to the exposure of the eyes to screen-based activity or time in front of the glass screen. Gadgets in children are too high, affecting visual acuity.

A total of 61 students who use gadgets for more than 4 hours with a decrease in the degree of vision of 56 students and 5 students with normal vision, the results of this study are supported by research by (Rudhiati et al., 2015) with the results of research obtained by 67 research respondents obtained 44 (65.7%) respondents playing video games that exceed 2 hours / day or more than 14 hours / week with almost normal vision. The results of statistical tests show that there is a relationship between the duration of playing video games and visual acuity in school-age children (Class III-IV) at SDN Majalaya 2 (P value = 0, 0001 \leq 0.005). From the results of the analysis, it is also known that students who play video games with abnormal duration have a 3.1-fold

increased chance of experiencing a decrease in visual acuity compared to students who play video games with normal duration (POR = 3.1, CI 95%: 1.8–5.5). This study is in line with the results of research by Hidayani et al. (2020) that there are more respondents who have used gadgets for more than or equal to 2 years, namely 93 respondents (85%), and there is a relationship between the length of gadget use and visual acuity with a value of $r = 0.357$, which means that the strength of the correlation is weak and the direction of the correlation is positive, which means that the relationship between the two variables is in the same direction, thus it can be interpreted that the higher the level of gadget use, the decrease in visual acuity will also increase. This study is consistent with Porotu et al. (2015)'s research on screen-based activity or time spent in front of a glass screen, namely >2 hours / day and 2 hours / day, which is seen in the univariate analysis that students of Santa Theresia 02 Manado Catholic Elementary School have a high screen-based activity >2 hours / day, namely 80%, with a probability value of $P = 0.025$ ($p < 0.05$). This says that there is a relationship between screen time and visual acuity.

According to the researcher, the current changing times cause schoolchildren to spend an inordinate amount of time watching television, reading comics or other reading, and playing games on laptops, cellphones, or tablets, causing a sharp decline in vision for children as well as causing stress in the function of vision when the accommodation muscle occurs when a person tries to look at small objects and at

close distances for an extended period of time. Under these conditions, the eye muscles will work continuously and more forcefully. The tension of the accommodating muscles (ciliary muscles) is greater so that there is an increase in lactic acid and, as a result, there is eye fatigue. Stress on the retina can occur when there is excessive contrast in the field of vision and a long observation time (Ilyas, 2004). Too long activities at the same viewing distance, such as working in front of a computer, a monitor screen, a machine, or a file, cause the eyes to continue to contract, causing the eye muscles to become abnormal. Reading while sleeping, reading in a dark place, reading under direct sunlight that glares, staring at direct bright light sources, and other bad habits that can interfere with eye health should be avoided.

According to Huang et al. (2015), the more and longer the time spent on close-range activities, the greater the risk of myopia. The duration of close viewing activities will stimulate biochemical and structural changes in the sclera and choroid that cause axial elongation (Ramamurthy et al., 2015).

The results of the study of 77 respondents discovered that the position when playing gadgets with a sitting position as many as 43 students and a lying position as many as 35 students can be seen that the Chi Square test obtained a p value = 0.415, which means that statistically there is no significant relationship between the position when playing gadgets with a decrease in sharp vision, which is consistent with the results of research by (Hidayani et al., 2020). Thus it can be

interpreted that the higher the level of gadget use with poor body position, the decrease in visual acuity will also increase. This study is in line with research conducted by Naron and Mahawati (2016), which states that based on the results of statistical tests between the position of using gadgets and subjective complaints of eye health problems using the chi square test and the results of the Pearson chi square 0.227 (> 0.05), it can be concluded that there is no relationship between the position of using gadgets and subjective complaints of eye health problems in students of SD Islam Tunas Harapan Semarang. Researchers argue that the habits of students at SMP Negeri 2 Makassar have a good body position when using gadgets. This can be seen from the results of the study, where 42 students (54.5%) used gadgets with a sitting body position. However, there are still respondents who use gadgets in a lying position of 35 (45.5%), which results in a bad impact on health if they continue to do the wrong thing and will have an impact.

5. CONCLUSION

According to the findings of a 2022 study on factors affecting visual acuity in adolescent gadget users at SMP Negeri 2 Makassar, there is no relationship between age, gender, use of glasses, type of gadget, and position of playing gadgets with decreased visual acuity, and there is a relationship between the duration of playing gadgets > 4 hours with decreased visual acuity ($p = 0.000$). to the school to conduct routine sharp vision checks at school in collaboration with the local

health center to detect and prevent the decline in sharp vision that has a health impact on adolescents.

6. ACKNOWLEDGEMENT

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7. CONFLICT OF INTEREST

No conflict of interest was declared

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