Research Article

The Use of Computers and Smartphones Associated with Decreased Visual Acuity in Mataram Informatics Engineering Students

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Abstract

Background: Excessive use of computers and smartphones can cause complaints of dizziness and watery eyes. if it happens continuously, it will be harmful to eye health.

Objectives: The study aimed to examine the relationship between the use of computers and smartphones with a decrease in visual acuity.

Methods: The study was correlational with a cross-sectional design involving 65 students and selected by total sampling. Data collection about using computers and smartphones used observation sheets and measuring visual acuity by Snellen charts. The Spearman rank test was employed to examine the relationship between variables.

Results: The use of computers and smartphones shows that in the high category as many as 10 (15%) respondents, 24 (37%) respondents in the medium category, and 31 (48%) in the low category. The results of the examination of visual acuity in the normal category were 4 respondents (6%), the nearly normal category were 30 (46%) respondents, and the less moderate category were 31 (48%) respondents. The P value (Sig. 2-tailed) is 0.000 with α 0.05, so 0.000 <0.05, meaning that there was a significant relationship between computer and smartphone use with a decrease in visual acuity.

Conclusion: The study shows that there was a relationship between the use of computers and smartphones with a decrease in visual acuity

Keywords: computers, smartphones, visual acuity

Introduction

A person's dependence on using a computer for a long time will affect human health, especially eye health.[1] This is supported by the results of a study that stated that the results of visual acuity examination were 54.7% of respondents had visual acuity abnormalities due to the use of gadgets and 45.3% had visual acuity in the normal category.[2] On the other side, different things were conveyed in research which said that there was no relationship between the length of use and viewing distance of gadgets with visual acuity in elementary school children grades 2 and 3 at Public Elementary School 027 Samarinda City.[3] About 60,000,000 people experience eye disorders and the total increases by 1,000,000 every

year. Most people who suffer from this eye disorder have jobs that make them frequently interact with computers. The cause of complaints of eye fatigue often occurs due to the projection of images on the eye continuously with fast frequency.[4] This is supported by research that obtained the results of the chi-square test showing that there was a significant relationship between the duration of excessive gadget use and decreased visual acuity, namely at the level ($< n = 0.005$).[5]

In a survey conducted by the American Optometric Association (AOA) not infrequently office workers complain of eye fatigue due to being too long in front of the computer and the electromagnetic wave radiation generated by the monitor screen. According to Occupational Safety and Health Administration (OSHA), a good rest when using a computer is by resting for 5 minutes after interacting with the computer for 30 minutes or resting for 10 minutes after working one hour.[6] Computer users should frequently take short but regular breaks, so that employees are not constantly dealing with computers. The eye rest rule that is often used when working at a computer is the 20-20-20 rule, it means that after working on a computer for 20 minutes, it is best if look away from the monitor screen by looking at objects that are 20 feet or about 6 meters from us for 20 seconds.[7] In addition to computers, smartphones are a type of cellular telephone that have higher capabilities than ordinary computers, usually have large screens and their operating systems are capable of running common application purposes. In 2009 the use of cellular phones increased in large numbers worldwide, namely more than 4.3 billion users.[8]

The data from the Ministry of Communication and Information in 2015, Indonesia is estimated to have around 55 million smartphone users, and is included in the top 5 smartphone users in the world and is expected to increase in 2018.[9] More than 90% of smartphones users experience health problems caused by using smartphones for too long such as tired eyes, blurry vision, double vision, dizziness, dry eyes, and ocular discomfort when seeing up close or from afar after long-term computer use.[8] Based on research data in November 2019 by observing and interviewing 15 students at one of the vocational high schools in Mataram City class of 2018, it was found that some students used computers excessively, namely more than 4 hours a day. And of the 15 students interviewed, on average they use smartphones for more than 6 hours a day. Students who use computers and smartphones complain of dizziness and watery eyes. Another fact that was found was that 7 students had used glasses as a tool to see.

Incorrect use of gadgets such as excessive frequency of gadget use, incorrect positioning, and bad lighting intensity, will have an impact on decreasing visual acuity. Decreased visual acuity in children will result in difficulties for children to carry out their daily activities. The increasing decrease in visual acuity in children will increase the risk of various complications of blindness, such as glaucoma and retinal abrasion.[10] Nurses as health workers who are responsible for improving a person's health status both physically and mentally, should participate in preventing decreased visual acuity in school-age children.[11] Where the basis of the implementation of these prevention efforts is evidence-based practice.

Seeing the magnitude of the impact caused by the use of computers and smartphones, researchers are interested in conducting a study on the relationship between computer and smartphone use and decreased visual acuity in computer informatics engineering students at one of the vocational high schools in Mataram City, West Nusa Tenggara Province.

Methods

This type of research was carried out using a descriptive correlational method with a cross-sectional design. This research was conducted at one of the vocational high schools in Mataram City, West Nusa Tenggara Province. The research population is all computer informatics engineering students. The sample was 65 students which was determined by total sampling. The entire sample was willing to be a respondent by signing an informed

consent. The data collection method uses a questionnaire that contains questions related to Unsafe actions in the use of computers and smartphones. This research questionnaire was adopted from Handriani's research (2016). The Snellen chart card was used to measure visual acuity.

The Snellen chart is in the form of a card that is used to measure visual acuity by looking at the eye's ability to read letters of various sizes at standard distances for the card.[2] The relationship between variables was tested using the Spearman rank test with the help of SPSS software.

Result

Table 1. Use of Computers and Smartphones

Category	n	%
High	10	15
Medium	24	37
Low	31	48
Total	**65**	**100**

Table 1 illustrates that most respondents using computers and smartphones were in the low category. It is almost two quarters (48%) of respondents.

Table 2. Visual Acuity Measurements

Category	n	%
Normal	4	6
Almost Normal	30	46
Less moderate	31	48
Less tangible	0	0
Total	**65**	**100**

Table 2 shows that the results of the visual acuity examination were mostly owned by respondents in the Less Moderate category, about 31 respondents (48%) followed by almost normal 46 %.

Table 3. Relationship Between Computer and Smartphone Use and Visual Acuity

Variable	Visual Acuity Measurements				Total	P- Value
	Normal	Almost Normal	Less Moderate	Less Tangible		
Use of Computers and Smartphones	N	N	N	N		
High	4	6	0	0	10	P = 0,000 < 0,05 (α)
Medium	0	18	5	0	23	
Low	0	6	26	0	32	
Total	**4**	**30**	**31**	**0**	**65**	

Based on Table 3, it was found that there was a relationship between the use of computers and smartphones with a decrease in visual acuity with the P value (Sig. 2-tailed) being 0.000 with α 0.05, so 0.000 <0.05.

Discussion

Use of Computers and Smartphones

The use of computers and smartphones is assessed based on the Unsafe action table 1 criteria, which means the use of computers and smartphones in a variety of ways. In addition to computers, smartphones are a communication tool that is widely used. Smartphones are considered entertainment and communication media such as Facebook, WhatsApp, and online games and make media that has a practical function, used as communication that can be carried anywhere which makes communication activities easier.

Based on the results of interviews with respondents, apart from computers, smartphones are a widely used communication tool. Smartphones are considered entertainment and communication media such as Facebook, WhatsApp, and online games and make media that has a practical function, used as communication that can be carried anywhere which makes communication activities easier. The development of technology is currently very rapid in all fields, especially in the field of information and communication. The result of the increasingly sophisticated development of information and communication technology is the smartphone. Smartphone is a smartphone that has many functions. More capabilities than ordinary phones and the many functions in it make people very dependent on smartphones.[12]

The growth of smartphone users in Indonesia from year to year has increased significantly, even according to Dyah et al. in 2018 all samples of Diponegoro University Medical Faculty students experienced smartphone dependence.[13] Even though they have many functions, smartphones have health impacts on the body, including emitting electromagnetic waves, upper extremity pain, and eye fatigue. Eyestrain is the biggest impact of smartphone use.[14] Therefore it is necessary to choose the right gadget or smartphone according to the needs, especially for children by considering the child's psychosocial development, where the theory presented by Erickson, at the school stage, children leave the family environment to the school environment so that all aspects have an important role, such as teachers, parents and friend.

Visual Acuity Level

In Indonesia, especially adolescents experience a decrease in visual acuity as the incidence of myopia is increasing. Many factors cause myopia, one of which is related to close-range activities, such as reading, writing, bad computer use, gadgets, and playing video games.[2]

Based on the visual acuity examination conducted on 65 respondents with a distance of 6 meters, respondents who had a vision in the category of moderately poor eyesight complained of not being able to see the letters shown by the researcher in the series which were included in the less moderate category, with evidence that the respondents leaned their faces forward so that their eyes were clearer look at the letters on the Snellen chart. The eyes that experienced a lot of decreased visual acuity in the respondents were the left eye as many as 27 respondents and 12 respondents had the same vision in the left and right eyes.

Factors that affect visual acuity include eye anatomy disorders, retinal structures, age, and physical stress from the habit of reading too closely, position, distance, and length of time staring at the monitor screen.[15] In this study, 50 respondents had the habit of using gadgets in a lying position, where the position when using gadgets can affect vision. This is also in line with research which states that the position of using gadgets in the incorrect category decreased visual acuity by 58.3 percent compared to using gadgets in the correct position which only decreased visual acuity by 41.7 percent.[16] Other supporting studies also state that the closer the distance, the greater the tendency for eye fatigue to arise, supported by the Spearman correlation value of -0.052.[17]

Based on the results of a study conducted on 65 respondents, the majority of respondents had the habit of using gadgets with a distance of <30 cm as many as 40 respondents (62%). Coupled with the current conditions, amid the Covid-19 pandemic which requires students to use gadgets because every school learning activity is carried out online, where the eyes will interact more often with gadget screens and are more often exposed to gadget screen light which can affect visual acuity.[18]

Experts say that more and more smartphones are being produced with brighter screens that are used day and night. Radiation generated from computer monitors and gadgets can affect health, especially eye health. Radiation that is stared at by the eye can cause a decrease in visual acuity.[19]

In this study, there were 43 respondents using gadgets with bright lighting. Furthermore, there were 66% of the respondents experienced a decrease in visual acuity. This research was in line with research which states that poor lighting will cause the eyes to accommodate more strongly and if left continuously will cause a decrease in visual acuity.[16] Based on the theory about the factors stated above associated with this research, it can be concluded that the use of computers and smartphones is influenced by various factors such as position when used, eye distance from the screen, lighting intensity, and duration of use which can affect visual acuity. Use of computers and smartphones in a lying position when using a smartphone, the eye distance from the screen is less than 30 cm, the intensity of bright lighting, and the duration of use of more than 2 hours can affect visual acuity.

Based on the results of the research above, it is important to recommend providing education to parents and schools to maintain visual acuity with interventions. What needs to be known is that parents need to know the reasons for giving gadgets to children, when to use them, how to use them correctly, and what foods to eat. helps prevent eye damage.

The Relationship Between Computer and Smartphone Use With Decreased Visual Acuity

Based on the results of the Spearman rank test, it was found that the p-value = 0.000 (p-value <0.05) it can be concluded that Ha is accepted and H0 is rejected with the conclusion that there was a relationship between the use of computers and smartphones with decreased sharpness vision of computer informatics engineering students at SMK Negeri 5 Mataram.

The correlation coefficient value with a value of 0.831 indicates a positive correlation with a very strong correlation. These results are reinforced by previous research which stated that the use of computers and smartphones is related to visual acuity. It is because when interacting with computers and smartphones, the eye muscles will be forced to work continuously to stay focused so they experience eye muscle tension resulting in eye fatigue which results in decreased vision visual acuity.[20]

In this study, it was found that respondents were more comfortable using smartphones in a lying position and for a long period of more than 2 hours per day at a distance that was too close which could affect a decrease in visual acuity. The habit of using smartphones or other gadgets for a long time is a bad habit, this is because when using these gadgets the eyes will stare at the gadget screen for a long time which puts additional pressure on the eyes and constituent nerves.[21] Paying attention to the proper viewing distance when using gadgets is important if you want to maintain eye health. When looking at an object, the eye will carry out accommodation activities, if the object is seen at a distance that is too far or close, the eye will accommodate optimally. This will cause the eyes to feel tired easily, so the eye muscles become easily weak and unstable.[22]

The wrong position when using computers and smartphones is also a cause of decreased visual acuity, these findings are in line with research which states that there is a significant relationship between body position when using gadgets and decreased visual

acuity.[2] Based on the description of the results and theory above, the researcher can conclude that many students experience decreased visual acuity due to the wrong use of computers and smartphones.

The results show moderate to low use of computers and smartphones by students but experiencing decreased visual acuity or problems. This means that there is good time management in using the gadget. Where students with the help of parents and teachers while at school can control the desire to use gadgets. This needs to be improved while still providing rules for usage time and discipline in carrying it out. While the decrease in visual acuity which is quite high means that students, parents, and teachers do not yet know how to use gadgets or techniques, so the use of techniques is only oriented toward the comfort of the gadget users. Therefore, education is needed regarding the correct technique or way of using gadgets such as position, distance, lighting, and other techniques, not just based on comfort.

Conclusion
There was a strong relationship between the use of computers and smartphones with decreased visual acuity.

Conflict of Interest Declaration
Researchers state that this research is independent of conflicts of interest.

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