THE CORRELATION OF SMARTPHONE USAGE BEHAVIOUR WITH THE VISUAL ACUITY AMONG HIGH SCHOOL STUDENTS IN BIREUEN, ACEH, INDONESIA

Zuhra Utami Putri[1], Alma Aletta[1], Nopa Arlianti[1], Tahara Dilla Santi[1], Fahrisal Akbar[1], Riza Septiani[1], Aryandi Darwis[1]
[1]Faculty of Public Health, University Muhammadiyah Aceh, Banda Aceh, Indonesia
Email: alma.aletta@gmail.com

Abstract: Refractive abnormalities can occur due to excessive lens accommodation and eye radiation as a result of extreme use of smartphones. About half of population and almost all teenagers in Indonesia are using smartphones. In fact, many teenagers bring their smartphones to school, causing those who are addicted to smartphones be able to use it for 6 to 8 hours daily. Considering excessive use of smartphones may resulted in impairment of visual acuity, so this study aimed to determine the correlation of smartphone usage behavior with the visual acuity among high school students in Bireuen District, Aceh, Indonesia. This research is a cross-sectional study and the data were collected on February 4 2019. Research participants for this study are high school students in SMPN 8 Peusangan, Bireuen District, Aceh, Indonesia, using total sampling method. A total of 88 respondents are included in quantitative data collection using questionnaires and the data were analyzed using univariate and bivariate analysis with Chi-Square test. The result of visual acuity measurement shows that more than half (52.3%) of respondents had a decrease of visual acuity, 78.3% of them have minor knowledge about factors related to impairment of visual acuity and have low eagerness to change their behaviour in using smartphone, 91.1% of respondents had negative attitude to to change their behaviour in using smartphone and 93.3% had no family history of visual acuity problem. In addition, the results shows that there is a relationship between knowledge (p value=0.001), action (p value=0.001), attitude (p value=0.001), and family history (p value=0.001) with visual acuity among respondents. Visual acuity impairment is one of considerable health issues among teenagers, particularly among those who use smartphones regularly. Health promotion regarding this issue needs to be improved, especially in school setting. It is expected that the school staffs and teacher in collaboration with health promotion officer in local health facilities could improve awareness and knowledge and motivate students to maintain eye health and visual acuity by increasing knowledge and establishing local school policies regarding the permission to bring and using smartphones at school.

Keywords: Health Behavior, Smartphone, Visual Acuity

Introduction

The uncorrected refractive error is the main cause of low vision in the world and can cause blindness. In 2010 it was estimated that as many as 285 million people in the world experienced visual impairments, 39 million people suffered from blindness and 246 million people experienced low vision due to uncorrected refractory disorders. To deal with the problem of blindness and visual disturbances, WHO created the Vision 2020 program which is recommended for its member countries to adopt, including Indonesia. Vision 2020 is a global initiative to deal with blindness and visual impairment throughout the world. In Indonesia itself Vision 2020 was launched on 15 February 2000, and has been set every Thursday in the second week of October as World Vision Day (WHO, 2010).

Indonesia occupies the fifth position in the world with the most smartphone users. It is predicted to have an average growth of almost 70% each year from 2010 to 2013 to increase

the smartphone market. Of every 100 smartphone users, 70 of them are teenagers who play an active role in using smartphones. This device fever has been going on since 2008, right when Facebook is on the rise and the percentage of cell phones in the country exceeds 50%. Indonesia has now even become one of the countries with the largest Facebook and Twitter users in the world, with 51 million and 19.5 million users respectively (Heriyanto, 2014 dan Anggit, 2014).

A survey conducted by the Indonesian Internet Network Providers Association (APJII) revealed that more than half of Indonesia's population is now connected to the internet. The survey conducted throughout 2016 found that out of 256.2 million Indonesians who had been connected to the internet were 132.7 million Indonesians. This indicates an increase of 51.8 percent compared to the number of internet users in 2014. The survey conducted by APJII in 2014 only saw 88 million internet users. The average internet access in Indonesia uses a handheld device. Based on statistical data 67.2 million people or 50.7 percent access through handheld devices and computers, 63.1 million people or 47.6 percent access from smartphones. Based on the results of this survey, it is illustrated that smartphones have been widely used in Indonesia and based on the data above it can be concluded that almost 50 percent of Indonesia's population accesses the internet through smartphones or smartphones (APJII, 2016).

According to a survey conducted by the Association of Indonesian Internet Network Providers (APJII) in 2014 for Aceh Province, internet users penetrated 2.4 million people or 49% of the total population of Aceh. While the data obtained from the Aceh Central Statistics Agency in 2015, the number of internet users in Aceh Province reached 16.81% while the districts / cities in Aceh Province that had the highest internet use were in the city of Banda Aceh as much as 63.38% followed by the city Lhokseumawe 32.95% (APJII, 2014).

According to research conducted by "The Nielsen Company" that most of the increase is dominated by adolescents, with more than 70% apparently having cellular phone connections. The number of teenagers aged 10-14 years who have a cellphone has increased more than five times over a five-year period (Nielsen, 2011).

With the concession of increasingly sophisticated science and technology, influencing the development of individuals in all aspects of life. Therefore, parents, families, schools and all elements of society are expected to collaborate actively and actively in tackling the effects of current technological advances. Parents have to reduce the use of smartphones in children because of the excessive use of smartphones now many children wear glasses, which are estimated to be around 30% of Indonesia's population. Conditions like now will be very difficult to not depend on smartphones. We are accustomed to working with laptops, socializing with smartphones or playing games with smartphones. Daily life using a smartphone has become our habit, but we must also be able to pay attention to the negative effects of using a smartphone that is too excessive (Winoto. H, 2013 dan Moeloek, 2014).

Mediasyifa Research (2014) mentioned some bad effects of smartphones on teenagers, namely on the health of personality, education / achievement as well as on family and society. A child who uses a smartphone with an excessive intensity of time will cause damage to the eyes, putting a strain on the cervical vertebrae and backbone, causing insomnia and causing nomophopia. In the development of personality, children feel their own world and are more aggressive towards their families and people around them. Children who continue to use a smartphone with excessive intensity for hours will run the risk of having headaches, blurred vision, difficulty seeing distant objects, and often squinting when seeing distant objects and discomfort in the eyes. Usually experienced by children aged 8 to 17 years who are very vulnerable to suffer from myopia or nearsightedness (Erin. S, 2012).

Smartphones are often used to play games, read e-mails, chat and watch videos. Letting the eyes interact with the smartphone for too long in the long run will cause the risk of

minus the eyes, other effects of eye fatigue, blurred vision and headaches that arise when using a gadget and forget to rest. Besides the eyes will also rarely blink, this causes the eyes to become dry (Handrawan, 2014).

Based on preliminary research conducted at SMP 8 Peusangan Bireuen District, researchers obtained information from the teacher that almost all students brought smartphones or smartphones to school despite the prohibition of carrying smartphones to school and frequent raids.

Vision is an important factor in daily life, because all information is first absorbed by the eye. Refractive disorders can be caused by excessive accommodation and radiation to the eye due to excessive use of smartphones or smartphones. Around 50% of the population of Indonesia already uses smartphones. Almost all teenagers in Indonesia use smartphones in their daily lives. Students who have a smartphone always bring their smartphone to school. Teenagers who are addicted to smartphones in a day can be more than 6-8 hours or even more able to use their smartphone. Excessive use of a smartphone results in interference with the sharpness of eyesight. For this reason, knowledge about eye health is needed for adolescents who use smartphones so they can find out the negative effects of excessive smartphone use on eye health. At SMPN 8 has computer lab facilities and also wifi that is easily accessible by the students, so that even though there is a prohibition on bringing smartphones / gadgets to school, students still bring smartphone / gadgets to school so that it attracts the attention of researchers to determine the relationship of the level of knowledge about eye health with behavior the use of smartphone students of SMP Negeri 8 Peusangan, Bireuen Regency in 2019.

Research Methods

This research is a descriptive analytic study with cross sectional design, where the independent and bound variables are examined at the same time as the study is conducted, which aims to determine the relationship between smartphone usage behavior and visual acuity of SMPN 8 Peusangan Bireuen Regency in 2019. Population in This research is all students of class VII, VIII, IX-I and XI-II in SMP 8 Peusangan, Bireuen Regency as the object of research, amounting to 88 people. Sampling is done by Total Sampling technique where each member of the population has the same opportunity to be selected as a sample. So, the number of samples in this study were all students in SMP 8 Peusangan, Bireuen Regency. The sample criteria in this study are having a smartphone or using a smartphone.

This research was carried out at SMP 8 Peusangan Bireuen Regency in 2019. This research was carried out on Tuesday 4 February 2019. The time of the study for approximately 3 hours included checking the sharpness of students' eyesight and filling out the questionnaire.

Results and Discussion

Result

Based on the results of research conducted on 88 students on February 4, 2019 at SMP Negeri 8 Peusangan District, Bireuen Regency about the relationship between smartphone usage behavior and visual acuity, the following results were obtained:

Univariate Analysis

Univariate analysis describes descriptively to see the frequency distribution based on the research variables as follows:

TABLE 1
DISTRIBUTION OF AGE FREQUENCY SMPN 8 PEUSANGAN, BIREUEN DISTRICT, 2019

No	Age Group	F	%
1	Early Adolescents (10-13 years)	24	27,3
2	Middle Adolescents (14-16 years)	64	72,7
	Total	88	100

Source : Primery Data 2019

Based on Table 1 of 88 respondents, the age of students is mostly in the middle adolescent category (14-16 years) as many as 64 respondents (72.7%), while early adolescents (10-13 years) as many as 24 respondents (27.3%).

TABLE 2
FREQUENCY DISTRIBUTION OF SEX STUDENTS SMPN 8 PEUSANGAN, BIREUEN DISTRICT, 2019

No	Sex	F	%
1	Male	43	48,9
2	Female	45	51,1
	Total	88	100

Source : Primery Data 2019

Based on table 2 of 88 respondents, there were mostly students in the female category with 45 respondents (51.1%), while men were 43 respondents (48.9%).

TABLE 3
FREQUENCY DISTRIBUTION OF VISUAL ACUITY MEASUREMENT OF STUDENTS SMPN 8 PEUSANGAN, BIREUEN DISTRICT, 2019

No	Measurement of visual acuity	F	%
1	Normal	42	47,7
2	Decrease	46	52,3
	Total	88	100

Source : Primery Data 2019

Based on table 6.3 of 88 respondents, the results of the student's visual measurement were mostly in the decreasing category of 46 respondents (52.3%), whereas normal were 42 respondents (47.7%).

TABLE 4
FREQUENCY DISTRIBUTION OF STUDENTS SMPN 8 PEUSANGAN, BIREUEN DISTRICT, 2019

No	Knowledge	F	%
1	Good	42	47,7
2	Bad	46	52,3
	Total	88	100

Source : Primery Data 2019

Based on table 6.4 of 88 respondents, the results of students' knowledge were mostly in the poor category of 46 respondents (52.3%), while both were 42 respondents (47.7%).

Bivariat Analysis

Relationship of Knowledge with Measurement of visual acuity

TABLE 5
THE RELATIONSHIP OF KNOWLEDGE WITH MEASUREMNET OF VISUAL ACUITY IN STUDENTS SMP 8 PEUSANGAN, BIREUEN DISTRICT, 2019

No	Measurement of visual acuity	Knowledge				Total	%	P Value
		Good		Bad				
		n	%	n	%			
1	**Normal**	32	76,2	10	21,7	42	100	0,001
2	**Decrease**	10	23,8	36	78,3	46	100	
	Total	42	47,7	46	52,3	88	100	

Source : Primery Data 2019

The bivariate analysis results in the table above shows the proportion of respondents who have less knowledge of 78.3% in the respondents who have the results of visual acuity measurements decreased greater than those of respondents with normal visual acuity only 21.7%. On the other hand, the proportion of respondents who had good knowledge of 76.2% of respondents who had normal visual measurement results was greater than that of respondents with visual acuity results which declined by only 23.8%.

Statistical test results show that there is a significant relationship between respondents' knowledge and visual acuity at Peusangan 8 Public Middle School in 2019 with a p value = 0.001.

Relationship of Action with Measurement of visual acuity

TABLE 6
THE RELATIONSHIP OF ACTION WITH MEASUREMNET OF VISUAL ACUITY IN STUDENTS SMP 8 PEUSANGAN, BIREUEN DISTRICT, 2019

No	Measurement of visual acuity	Action				Total	%	P Value
		Good		Bad				
		n	%	n	%			
1	**Normal**	29	74,2	13	26,5	42	100	0,001
2	**Decrease**	10	25,6	36	73,5	46	100	
	Total	39	47,7	49	52,3	88	100	

Source : Primery Data 2019

The bivariate analysis results in the table above shows the proportion of respondents who had less action by 73.5%, for respondents who had lower visual acuity measurements than those with normal visual acuity only 26.5%. Conversely, the proportion of respondents who had good actions by 74.2% of respondents who had a normal visual measurement result was greater than the respondent who had a visual decline decreased by only 25.6%.

Statistical test results show that there is a significant relationship between the actions of the use of respondents 'smartphones with the sharpness of students' vision at SMU 8 Peusangan Bireuen in 2019 with a p value = 0.001.

Relationship of Attitude with Measurement of visual acuity

TABLE 7
RELATIONSHIP ATTITUDE WITH MEASUREMNET OF VISUAL ACUITY IN STUDENTS SMP 8 PEUSANGAN, BIREUEN DISTRICT, 2019

No	Measurement of visual acuity	Attitude				Total	%	P Value
		Positive		Negative				
		n	%	n	%			
1	**Normal**	38	88,4	4	8,9	42	100	0,001
2	**Decrease**	5	11,6	41	91,1	46	100	
	Total	43	47,7	45	52,3	88	100	

Source : Primery Data 2019

The bivariate analysis results in the table above shows the proportion of respondents who had a negative attitude of 91.1% of respondents who had a visual acuity measurement decreased greater than those of respondents with a normal visual acuity of only 8.9%. Conversely, the proportion of respondents who had a positive attitude of 88.4% in respondents who had a normal visual acuity measurement result was greater than the respondent who had a visual acuity decline of only 11.6%.

Statistical test results show that there is a significant relationship between the attitude of the use of respondents 'smartphones with the sharpness of students' vision at SMU 8 Peusangan Bireuen in 2019 with a p value = 0.001.

Relationship with Measurement of visual acuity

TABLE 6.12
RELATIONSHIP BETWEEN FAMILY EYE VISITING WITH MEASUREMNET OF VISUAL ACUITY IN STUDENTS SMP 8 PEUSANGAN, BIREUEN DISTRICT, 2019

No	Measurement of visual acuity	Family Eye Visiting				Total	%	P Value
		Available		Not Available				
		n	%	n	%			
1	**Normal**	39	90,7	3	6,7	42	100	0,001
2	**Decrease**	4	9,3	42	93,3	46	100	
	Total	43	47,7	45	52,3	88	100	

Source : Primery Data 2019

The bivariate analysis results in the table above show the proportion of respondents who did not have a family acuity history of 93.3% in respondents who had lower visual acuity measurements than respondents with normal visual acuity results of only 6.7%. Conversely, the proportion of respondents who have a family acuity history of 90.7% of respondents who have a normal visual acuity measurement results are greater than those with a visual acuity decline of only 9.3%.

Statistical test results show that there is a significant relationship between the history of the eyesight of the respondent's family and the students' visual acuity at Peusangan 8 Public Middle School in 2019 with a p value = 0.001.

Discussion

The Relationship between Knowledge and Measurement of visual acuity for Students of SMP 8 Peusangan, Bireuen Regency in 2019

This study aims to determine whether there is a relationship between knowledge and visual measurement results of students at SMU 8 Peusangan Bireuen Regency through descriptive analytic research methods with cross sectional study approach. The sample in this study is total sampling, which is 88 students as a whole.

The results of research at SMU 8 Peusangan Bireuen District showed that there was a relationship between knowledge and the sharpness of the eyesight of students who experienced decreased visual measurement results (P value 0.001). The results showed that respondents with decreased visual acuity had decreased vision compared to good knowledge respondents. Whereas respondents with good knowledge with visual acuity results in higher normal vision compared with less knowledge.

The results of this study support research conducted by Syarifah Askial (2015) which shows there is a relationship between lack of knowledge and a decrease in visual examination results or a sharp decrease in vision in Banda Aceh 69 elementary school students (p value 0.001). Another research conducted by Refiul Niaty (2015) in elementary school children with the result that there is a relationship between knowledge with the results of visual examination or the results of the examination of the eye's eye acuity in students (p value 0.003).

Based on the research conducted, it is known that the level of knowledge of students of SMPN 8 Peusangan Bireuen Regency in 2019 out of 88 students, that the majority of students' knowledge is in the category of less than 46 respondents (52.3%). This makes researchers feel the need for counseling to schools so that students have more knowledge about the sharpness of eye vision and can better maintain eyes better.

According to Saraswati (2014) that with enough knowledge it will increase awareness of eye health or visual acuity for smartphone users so that they can maintain their eye health. If the eyes can be maintained properly they will function properly and will not interfere with daily life for activities.

The Relationship between Actions and Measurement of visual acuity of SMP 8 Peusangan Bireuen Regency 2019

The results of research at SMU 8 Peusangan Bireuen District showed that there was a relationship between the action and the sharpness of the eyesight of students who experienced decreased visual acuity measurements (P value 0.001). The results showed that respondents with decreased visual acuity had decreased action compared to good respondent. Whereas for respondent good actions with visual acuity results in higher normal vision compared with less action.

The results of this study support the results of research conducted by Sharen and Kurnia (2015) which shows there is a relationship between unfavorable actions in excessive use of smartphones over 6 hours, causing a decrease in visual acuity reaching 69%. This shows that the act of using a smartphone is included in the high category based on the average percentage results.

Based on the research conducted, it is known that the act of using smartphone students of SMPN 8 Peusangan Bireuen Regency in 2019 out of 88 students, that the actions of students were mostly in the category of less than 36 respondents (73.5%). This shows that the act of using a smartphone on students exceeds a good period of time for smartphone use on a daily basis which has a decreased impact on students' visual acuity.

The actions of adolescents who often use smartphones in their daily lives for long periods of time have a negative impact on the health of their eyes, one of which is the sharp disruption of vision which results in having to wear glasses. If sharp eyesight is interrupted and uncorrected, the result is causing the eyes to feel tired, dry, and dizzy on the head because it forces the eye to over-accommodate, and the most severe is the occurrence of lazy eyes due to an uncorrected refractive disorder (Maulida and Hidayathi, 2013).

The Relationship between Attitude and Measurement of visual acuity of SMP 8 Peusangan Bireuen Regency 2019

The results of research at SMU 8 Peusangan Bireuen District showed that there was a relationship between attitude and the sharpness of eyesight of students who experienced decreased visual acuity measurements (P value 0.001). The results showed that respondents with decreased visual acuity had decreased negative attitudes compared to respondents who had positive attitudes. Whereas for respondents who have a positive attitude with visual acuity the results of normal vision are higher than negative attitudes.

The results of this study support the results of research conducted by Muflih (2017) which shows there is a relationship between negative attitudes in excessive smartphone use and visual acuity. It is known that the p value is 0.004 which means that there is a significant relationship between the attitude of using a smartphone with the measurement results of vision or sharpness of eyesight of teenagers in SMA Negeri 1 Kalasan Yogyakarta.

Based on the research conducted, it is known that the attitude of smartphone use of students of SMPN 8 Peusangan Bireuen Regency in 2019 of 88 students, that the attitude of students is mostly in the negative category as many as 41 respondents (91.1%). This shows that the attitude of smartphone usage on students is not good, such as time of use, distance of use, and position when using a smartphone on a daily basis which has a negative impact on students' visual acuity.

The attitude of teenagers who often use a smartphone for a long time and in an incorrect position causes the eyes to become sore and painful and feel dry. Incorrect position in using a smartphone will cause pain in the spine and make the eyes more quickly affected by refractive abnormalities (Widea, 2015).

The Relationship between History of Family Eyesight Sharpness and Measurement of visual acuity of SMP 8 Peusangan Bireuen Regency 2019

The results of research at SMU 8 Peusangan Bireuen District showed that there was a relationship between the history of family eye acuity and the eye acuity of students who experienced decreased visual acuity measurements (P value 0.001). The results showed that respondents with decreased visual acuity did not have a family history of higher eye acuity compared to respondents who had family acuity. Whereas for respondents who have a family history of visual acuity with visual acuity results are higher than those with no family acuity history.

The results of this study support the results of research conducted by Melita (2013) which shows there is a relationship between the history of parents who have refractive abnormalities with children who have decreased visual acuity where of the 44 respondents who have decreased visual acuity, found 18 respondents have a history of refractive abnormalities or decreased visual acuity in the family, while of the 26 respondents who did not experience decreased visual acuity, 3 people had a family history and obtained a p value of 0.010 which was obtained by the Chi-Square test.

Several studies have shown that hereditary risk factors are the most important factors causing refractive abnormalities or decreased visual acuity. Parents who have refractive abnormalities tend to have children who have refractive abnormalities as well. Goss's research states that there is a refractive abnormality in children whose parents have refractive abnormalities, which is 33-60%, in children who have one parent who has a refractive abnormality 23-40% and only 6-15% in the second child his parents did not have a refractive disorder (Goss, 2014).

Based on the research conducted, it is known that the history of visual acuity of family students of SMU 8 Peusangan Bireuen Regency in 2019 of 88 students, that the history of acuity of the eyes of students' families was mostly in the category with no history of family

eye acuity that was 42 respondents (93 , 3%), while the category there is a history of family eye acuity that is as many as 39 respondents (90.7%). So from the results of the chi-square test statistics obtained p value 0.001 or p value <0.05 so that it can be known working hypothesis (Ha) is accepted, which means there is a relationship there is a history of sharpness of vision of the eyes of the family with visual measurement results.

Children with parents who experience refractive abnormalities tend to also experience refractive abnormalities. Pravelensi refraction abnormalities in children whose parents have refractive abnormalities is 32.9%, whereas in children with only one parent who experience refractive abnormalities is about 18.2%, and less than 8.3% in children with parents without refractive abnormalities (Komariah, 2014).

In 2014, Kathryan A. Rose compared pravelensi and risk factors for refractive abnormalities in ethnic Chinese children in Sydney and Singapore with the criteria that both parents have Chinese ethnicity higher in Singapore at 29.1% than in Sydney. It can be seen that there is a relationship between the history of family eye acuity and refractive abnormalities.

Conclusions

1. 1. Of the 88 respondents, the results of the student's visual measurement were mostly in the decreasing category of 46 respondents (52.3%), whereas normal were 42 respondents (47.7%). Many students do not know that the sharpness of their eyesight decreases because they rarely check the sharpness of their eyesight to the doctor even some have never checked the sharpness of their eyesight.
2. 2. There is a significant relationship between knowledge and the results of the measurement of visual acuity of students' visual acuity at Peusangan 8 Public Middle School Bireuen (p value 0.001).
3. 3. There is a significant relationship between the action and the results of the reduction in the visual acuity of students' visual acuity at Peusangan 8 Public Middle School Bireuen (p value 0.001).
4. 4. There is a significant relationship between attitudes and the results of the measurement of visual acuity of students' visual acuity at Peusangan 8 Public Middle School Bireuen (p value 0.001).
5. There is a significant relationship between the history of family eye acuity acuity and the results of visual acuity of students' visual acuity at 8 Peusangan Bireuen Regency (p value 0.001).

Recommendations

1. 1. For SMPN 8 Peusangan, Bireuen Regency is expected to be able to put up posters about the impact of excessive smartphone use on visual acuity.
2. For students of SMPN 8 Peusangan Bireuen Regency are advised
   a. In order to be able to check the visual acuity to the eye doctor for 6 months.
   b. In order to be able to add insight knowledge about the effects of excessive smartphone use.
   c. In order to reduce the actions that are less good in the use of smartphones.
   d. In order to reduce the negative attitude in using a smartphone that is by reducing the time in using a smartphone.
3. This research is the first study conducted at the Faculty of Public Health, University of Muhammadiyah Aceh. But there are still many shortcomings in this study so that future researchers who will conduct research similar to this can conduct research better and

more independent variables including variables of sleep quality, eating patterns, social development, and can also use different research methods. Hopefully this research can be a reference for future researchers.

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