

**Relationship Between Rate of Smartphone Addiction and Incidence of Digital Eye Strain in Adolescents****Berna Detha Meilyana<sup>1\*</sup>, Nofriadi B<sup>1</sup>, Arif Setyawan<sup>1</sup>, Heri Suroso<sup>2</sup>, Hanifuddin Dwi S<sup>1</sup>, Ekwantoro<sup>3</sup>**<sup>1</sup> Nursing Program Study, STIKES Bhakti Mulia Pare, Kediri, Indonesia<sup>2</sup> Nursing Department, STIKES Adi Husada, Surabaya, Indonesia<sup>3</sup> Kertosono Hospital, Indonesia**Correspondent Author:**

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**Abstract**

The impact of the COVID-19 pandemic has had a big impact on the world of education. Because of online learning, smartphones have a very important role in meeting these needs. Smartphones have a negative impact that can be felt by students when used in their continuous learning is Digital Eye Strain (DES) or often referred to as eye fatigue. This study aims to determine the relationship between the rate of smartphone addiction and the incidence of digital eye strain in adolescents aged 13 – 15 years at Yohanes Gabriel Pare Junior High School. This study used a cross-sectional design. The sample selection used purposive sampling with a total of 115 respondents. The research was conducted using DES questionnaires. The results of the Kendall's Tau test showed that the correlation test results were known to have a significance value, or Sig. (2-tailed), between the variable level of smartphone addiction and the incidence of DES was 0.001. While the correlation is significant at 0.05, the value is  $0.001 < 0.05$ . There is a significant relationship between the level of smartphone addiction and the incidence of digital eye strain in adolescents aged 13-15 years at Yohanes Gabriel Pare Junior High School. Smartphone addiction can affect eye function. The duration and frequency of prolonged smartphone use can affect dry eyes, redness, and the onset of DES symptoms.

**INTRODUCTION**

Smartphones are sophisticated items that are created with various applications that can present various social media, social networks, online games, and even other entertainment. The use of smartphones among students is a necessity in supporting activities in the field of education (Apuke & Iyendo, 2018). The impact of the COVID-19 pandemic has had a big impact on the world of Education. The government recommends holding online learning to prevent the spread of COVID-19 (Nisa, Permana, & Firmansyah, 2020).

With online learning, smartphones have a very important role in meeting these needs. Its role and effectiveness have greater power compared to laptops and computers. Many applications can facilitate student learning, such as *zoom*, *google classroom*, *learning house* and many more (Reynanda, 2021) The use of Smartphones also has a positive impact on students, namely being able to access materials wherever they are and anytime, besides that it is very easy to use and many features can be accessed for free, this makes students more interactive. However, smartphones also harm students' physical health. One of the negative impacts that students can feel when using smartphones in their continuous learning is *digital eye strain* (DES) or what is often called eye fatigue (Tambun, 2021).

Based on the Global Web Index data survey, Indonesia is the country with the most active social media users in Asia. Indonesia has 79.7% active users on social media beating the Philippines 78%, Malaysia 72% and China 67% (Abdu, Saranga, Sulu, & Wahyuni, 2021) It was recorded that 97.4% of the sites accessed were in the form of social media (Dedyerianto, 2020) The results of a preliminary study that has been conducted on 25 students of Yohannes Gabriel Pare Catholic Junior High School randomly, obtained as many as 15 students who experience signs and symptoms of pain in the neck, dry eyes and blurred vision, these are signs and symptoms of digital eye syndrome.

Smartphones are the main source of electromagnetic waves and can have an impact on health. Accessing social media continuously will affect a person's vision, this is due to the influence of High Energy Visible (HEV) rays or also called blue light rays, which are one of the very strong light spectrums produced by modern electronic equipment. This light is one of the causes of vision problems (Shantakumari, Eldeeb, Sreedharan, & Gopal, 2016) According to *the American Optometric Association*, the use of smartphone to access social media continuously for more than 2 hours per day is enough to cause various problems related to eyes and vision, and can be called a Digital eye strain (DES) (Bahkir & Grandee, 2020).

*Digital eye strain* (DES) or eye fatigue is a manifestation of dry eyes caused by a decrease in the rate of low eye blinking, this can cause dry surfaces in the eyes and symptoms of asthenopia (Gammoh, 2021) The most common symptoms felt by students who often use smartphones in their learning include eye fatigue, headache, blurred vision, dry eyes, pain in the neck and shoulder (Bhattacharya, Saleem, & Singh, 2020) Meanwhile, external symptoms that appear such as burning, eye irritation and dry eyes often also accompany the sufferer as the initial symptoms that arise. In addition to internal symptoms of eye tension, eye pain in the back of the head of the eye is related to accommodative or binocular vision stress, and what is often felt by adolescents is the emergence of signs and symptoms of redness in the eyes, sore eyes (Sheppard & Wolffsohn, 2018).

## RESEARCH METHODS

This study is a type of quantitative research that uses a correlational descriptive research design with a cross-sectional approach that aims to determine the Level of Smartphone Use Addiction with the Incidence of Digital Eyes Syndrome in Adolescents. The population in this study is school students who use smartphones at Yohanes Gabriel Pare Catholic Junior High School, with a total population of 162 students. The sample in this study was 115 respondents. The inclusion criteria in this study were students who were willing to be respondents and who used social media. This research was conducted at the Yohanes Gabriel Pare Catholic Junior High School in August 2022. The instrument used in this study was a DES questionnaire. The data analysis used the Kendall's Tau test. This study has passed ethical clearance, with the letter number 021/bk/STIKes.BM/Kep/XII/2022, dated October 17, 2022.

## RESULT

Table 1 showed the age of the respondents in this study is categorized into 3 groups, the first is 13 years old as 22 respondents with a percentage of 19.1%, 14 years old as many as 58 with a percentage of 54.4% and 15 years old as many as 35 respondents with a percentage

of 30.5%. There are two groups of gender in the respondents of this study, namely women, as many as 39 respondents with a percentage of 33.9%, and men, as many as 76 respondents with a percentage of 66.1%. Meanwhile, the most activities carried out by respondents were playing social media, which was 63 respondents with a percentage of 54.8%, and then playing games, as many as 52 respondents or 45.2%. The results of the analysis of data on the length of smartphone use in a day showed that the duration of < 2 hours was 28 respondents, or 24.3%, and the duration of > 2 hours was 87 respondents, or 75.7%.

Table 1. Distribution of Respondent Characteristics (n=115)

General data of respondents	Classification	Frequency (n)	Percentage (%)
Age	Age 13	22	19.1
	Age 14	58	50.4
	Age 15	35	30.5
	Total	115	100
Gender	Men	76	66.1
	Women	39	33.9
	Total	115	100
Activities using smartphones	Social Media	63	54.8
	Gaming	52	45.2
	Watch videos and listen to music	0	0
	Brow-sing internet	0	0
	Chat	0	0
	Total	115	100
Length of smartphone use in a day	< 2 hours	28	24.3
	>2 hours	87	75.7
Total		115	100

Table 2. Distribution of Smartphone Addiction Rate and DES Event (n=115)

No.	Intensity	Frequency	Percentage(%)
1	Tall	10	8.7
2	Keep	96	83.5
3	Low	9	7.8
	Total	115	100
No.	Occurrence of DES	Frequency	Percentage(%)
1	Light	1	0.9
2	Keep	4	3.5
3	Severe	110	95.6
	Total	115	100

Table 2 shows the results of the frequency distribution, that as many as many as 96 respondents, or 83.5% are included in moderate smartphone addiction, and as many as 9 respondents, or 7.8% are included in low smartphone addiction. The frequency distribution shows that as many as 1 respondent, or 0.9%, are included in the incidence of mild DES, and as many as 110 respondents, or 95.7%, were included in the incidence of severe DES.

Table 3. Analysis of the Relationship between Smartphone Addiction Level and Digital Eye Strain (DES) Incidence

			Intensity	DES
Kendall's Tau	Smartphone addiction rate	Correlation Coefficient	1.000	.313*
		Sig. (2- tailed)	—	.001
		N	115	115
	Occurrence of DES	Correlation Coefficient	.313*	1.000
		Sig. (2- tailed)	.001	—
		N	115	115

Based on the results of the Kendall's Tau test, it was shown that the correlation test results were known to have a significance value, or Sig. (2-tailed), between the variable level of smartphone addiction and the incidence of DES was 0.001. While the correlation is significant at 0.05, the value is  $0.001 < 0.05$ . From these values, it can be concluded that there is a significant relationship between the variable of relationship between the level of smartphone addiction and the incidence of digital eye strain in adolescents aged 13-15 years at Yohanes Gabriel Pare Junior High School.

## DISCUSSION

The level of addiction experienced by adolescent respondents shows that the rate of addiction is the highest number of junior high school students. This research is in line with several previous studies that stated that many students experience low to high smartphone addiction. The average smartphone use by adolescents for 6 hours per day is even more (Sumpa & Barkah, 2022). Smartphone addiction negatively affects an individual's daily life, both socially, physically, and psychologically. Individuals who experience smartphone addiction prefer interaction through social media to having to meet in person, feel tired quickly, headaches, and physical disorders such as joint pain, which can cause a person to become stressed, anxious, and depressed. In addition, the disorders that respondents often complained about were complaints of dry eyes, difficulty focusing on visual objects, strained eyes, and headaches. Eye fatigue or eye fatigue is the most common complaint found due to the continuous direct interaction of the eyes with gadgets.

The pathophysiology underlying the occurrence of DES conditions includes oculomotor abnormalities and dry eyes. As we all know, looking at objects up close requires an

accommodation response and also the appropriate vergence in order to produce a clear picture. Blurred vision when looking at objects from a distance or when looking at a distance after prolonged computer use is a symptom often associated with DES. This can be caused by an improper accommodation response while using the computer or a failure to relax the accommodation response after continuously looking at objects nearby. Dry eyes can also contribute to the appearance of DES-related visual impairments, where it was found that the prevalence of dry eye symptoms was more common when using smartphones excessively. The impact of eye fatigue will show symptoms, including pain that feels throbbing around the eyes, blurred vision or vision, double or double vision, difficulty eyes to focus, sore eyes, red eyes, watery eyes, itchy eyes, dryness, headache, dizziness accompanied by nausea (Widyadana, 2022).

The results of research that have been carried out state that there is a relationship between smartphone addiction and the incidence of digital eye strain. This is in line with research that has been conducted (Saputra & Inayah, 2021), which states that eye fatigue occurs in some respondents. The symptoms most often experienced by respondents are dry eyes, watery eyes, and headaches. Meanwhile, the symptoms of eye fatigue that are rarely experienced by respondents are decreased accommodation and convergence, double vision, and decreased visual acuity. Excessive use causes eye fatigue, with the initial symptom that arises being dry eyes. This is because when the eyes of teenagers stare at the cellphone screen with focus, the intensity of their blinking will decrease. In addition, another cause is blue light, or blue light emitted by the cellphone screen. Blue light, if it enters the eye too often, will cause stress on the retina. This is because blue light is a light that can reach the back of the eye, namely the retina, so it causes fatigue in the retina. Research states that if the duration of use of gadgets in one day is longer, it is directly proportional to the number of symptoms that will be felt related to the incidence of DES (Widyadana, 2022). Adolescents tend to use smartphones at very close distances, which results in the ciliary muscles as the formation of the eyepiece becomes a chronic spasm, so that there is an elongation of the eyeball axis, which causes a decrease in eye sharpness or vision in seeing distant objects. Often we see that many teenagers use their smartphones in a day for more than 2 hours just for the pleasure of fulfilling to play with their smartphones, so action is needed to prevent the impact of excessive smartphone use by reducing the intensity of smartphone use.

## CONCLUSION

There is a significant relationship between the level of smartphone addiction and the incidence of digital eye strain in adolescents aged 13-15 years at Yohanes Gabriel Pare Junior High School, which has been conducted by the Kendall's Tau test.

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