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Asthenopia and Its Correlation in Using Laptop Duration of Tarumanagara University Students

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Abstract

The COVID-19 pandemic has caused the use of electronic devices since many activities have moved online. The use of computers (desktops), tablets, laptops or other electronic devices (smartphones or e-book readers) has increased the incidence of asthenopia. This study aims to determine the incidence rate of eye fatigue or asthenopia for students in UNTAR Medicine and Engineering Faculties, as well as to compare the incidence rate among students in both faculties to recognize the relationship between the duration of laptop use and the incidence of asthenopia. Three hundred forty-seven respondents from the Faculties of Medicine and Engineering, class of 2019-2021, who had studied for at least five months. The prevalence of asthenopia in the Faculty of Medicine is 86,26%, and in the Faculty of Engineering is 82,35%, with a total of 85,30% in both faculties. There is no difference in the incidence of asthenopia between students of the Faculty of Medicine and the Faculty of Engineering, University of Tarumanagara. During online learning, 98,10% of students from the Faculty of Medicine and 92,94% from the Faculty of Engineering spent >2 hours studying using a laptop. In addition, the results show that there is no significant difference between symptoms and time staring at a laptop screen. The Chi-Square test results revealed a significance value of 0.122. It means there is no correlation between the length of time staring at a laptop screen and asthenopia symptoms.

Keywords: *Asthenopia, Laptop, Online, UNTAR*

INTRODUCTION

Regarding to prevent the spread of Corona Virus Disease (COVID-19) in Indonesia, a Circular Letter was issued by the Minister of Education and Culture Number: 36962/MPK.A/HK/2020 on March 17, 2020 on the regulation of online learning and working from home. Applicable regulations include the implementation of online learning from home for students through video conferencing, digital documents, and other digital means (Abidin, Rumansyah and Arizona, 2020).

Based on research conducted by Beng *et al.* in 2019, the average teenager uses gadgets for 2-4 hours/day. Since the COVID-19 pandemic occurred, the use of gadgets is unlikely to be limited to a maximum of three hours/day. This is because gadgets are used for online learning, and teenagers are used to doing online learning for 3-4 hours/day. They often have to do tasks using their gadgets. Observations in some high school students found that they often carried out learning activities with teachers, structured activities, and independent activities a maximum of six hours a day (Beng *et al.*, 2020) .

The increased use of computers (desktops, tablets, and laptops) or the use of other electronic devices, such as smartphones or e-book readers, has increased the incidence of asthenopia (Agarwal *et al.*, 2013; Rosenfield, 2011). According to Gowrisankaran & Benedetto (in Xu *et al.* 2019), asthenopia is a syndrome of subjective sensation of visual discomfort that significantly impairs attention and academic performance and limits working capacity (Xu *et al.*, 2019) . Asthenopia is commonly known as eye strain (as-the-no-pia: eye fatigue) (V.K. and MS, 2012; Wajuihian, 2015). Symptoms of asthenopia occur if a person has experienced at least one of the following: eye strain, itchy eyes, blurred vision, dry eyes, red eyes, sore eyes, burning eyes, or headaches plus at least one of the above eye symptoms in the last five months. If a person only experiences symptoms of headaches, then it cannot be called suffering from asthenopia (Sawaya *et al.*, 2020) .

Based on research that has been conducted at the Faculty of Public Health, Sam Ratulangi University Manado in the era of the COVID-19 pandemic on 74 students, it is known that the prevalence of asthenopia during smartphone use shows a result of 82,4% (Gumunggilung *et al.*, 2021). Research conducted by Mohan *et al.* on children attending online classes during the COVID-19 pandemic showed a prevalence of asthenopia of 50,23% with the average duration of digital device use during the COVID-19 era increasing to 3.9 ± 1.9 hours compared to before the COVID-19 era which was only 1.9 ± 1.1 hours (Mohan *et al.*, 2020) .

During the COVID-19 pandemic, the use of gadgets is expected to shift from being dominated by smartphones to laptops or *Personal Computers* (PCs). The use of laptops is estimated to be more suitable for studying and doing tasks rather than using a smartphone (Beng *et al.*, 2020) . Therefore, this causes laptops also be widely used by students. However, the incidence of asthenopia during online

learning using a laptop still has less attention in previous studies (Mohan *et al.*, 2020) . Health professionals need to be aware with the complaints of visual fatigue due to its potential to affect learning and school performance (Vilela *et al.*, 2015) .

Research conducted by Logaraj *et al.* (2014), on students of the Faculties of Medicine and Engineering at a university in Chennai India showed that before the COVID-19 pandemic, it was found a prevalence of asthenopia of 80,3%. The prevalence among Engineering students was found at 81,9%, while among medical students was found at 78,6%. Here, the engineering students are at higher risk of asthenopia than the medical students (Logaraj *et al.*, 2014). Comparison of the prevalence of asthenopia in students of the Faculties of Medicine and Engineering during the pandemic is not yet known, as well as the prevalence at Tarumanagara University. Thus, the researchers conducted a research on the prevalence of asthenopia in students of the Faculty of Medicine and Faculty of Engineering at Tarumanagara University.

METHOD

This research is a quantitative study with cross-sectional data collection. This study used a questionnaire instrument to obtain data on (1) demographics; (2) faculty origin; (3) the use of digital devices, the type of device and the duration of time spent using it; (4) the reason for using the digital device; (5) symptoms of asthenopia, and (6) precautions. Data collection was carried out from November 2021-April 2022. The sample of this study employed students of the Faculty of Medicine and the Faculty of Engineering at Tarumanagara University in Jakarta. The calculation minimum sample required in this study was 82 students from each faculties.

The inclusion criteria in this study were from the active students of the Faculty of Medicine and the Faculty of Engineering, Tarumanagara University batch 2019-2021, who have conducted online learning for at least five months using a laptop. Meanwhile, the exclusion criteria included amblyopia, conjunctivitis, inflammation/eye infections, hypertension, chronic migraines, chronic headaches, strabismus, high myopia (more than -6.0 Diopters), glaucoma or cataracts, and a history of eye surgery. The free variable in this study was the duration of laptop use and the bound variable was asthenopia. The test in this study used Chi-square.

RESULT

A study conducted at the Faculty of Medicine and Faculty of Engineering, Tarumanagara University, respondents who wanted to fill out the questionnaire were 395 students from the Faculty of Medicine and 134 students from the Faculty of Engineering. Respondents who met the exclusion criteria from the Faculty of Medicine were 133 students and from the Faculty of Engineering were 49 respondents, so that the total respondents who met the inclusion criteria were 262 students from the Faculty of Medicine and 85 students from the Faculty of Engineering, with a total of 347 respondents in both faculties.

Table 1. Characteristics Respondents

Characteristics	Medicine		Engineering	
	n	%	n	%
Age				
≤18 year	58	22.14	16	18.82

Characteristics	Medicine		Engineering	
	n	%	n	%
19-21 year	192	73.28	65	76.47
22-24 year	11	4.20	4	4.71
≥ 25 year	1	0.38	0	0.00
Gender				
Men	75	28.63	49	57.65
Women	187	71.37	36	42.35
Force				
2019	43	16.41	27	31.76
2020	86	32.82	6	7.06
2021	133	50.76	52	61.18
Laptop Usage Duration (Hours Per Day)				
< 2 clock	2	0.76	1	1.18
2-4 clock	11	4.20	19	22.35
> 4-6 clock	78	29.77	33	38.82
> 6 clock	171	65.27	32	37.65
Symptom				
Dry eyes	103	39.31	30	35.29
Red eye	72	27.48	24	28.24
Strained eyes	82	31.30	18	21.18
Itchy eyes	100	38.17	22	25.88
Sore eyes	82	31.30	32	37.65
Burning eyes	15	5.73	7	8.24
Blurred vision	98	37.40	19	22.35
Headache	202	77.10	49	57.65
Asthenopia Incident				
Asthenopia	226	86.26	70	82.35
Not asthenopia	36	13.74	15	17.65

Table 1 shows hours per day used staring at laptop digital screens in Faculty of Medicine students with a total of more than six hours at 65,27%, while Faculty of Engineering students at 37,65%. In students of the Faculty of Engineering, the majority of respondents (38,82%) use laptops for 4-6 hours. The symptoms often experienced by respondents were dominated by headaches in the Faculty of Medicine and the Faculty of Engineering, with a percentage of 77,10% at the Faculty of Medicine and 57,65% at the Faculty of Engineering. Symptoms that respondents less commonly experienced in both faculties were burning eyes, with a percentage of 5,73% in the Faculty of Medicine and 8,24% in the Faculty of Engineering. Of the total 347 respondents, 86,26% of the respondents to the Faculty of Medicine and 82,35% of the respondents to the Faculty of Engineering experienced asthenopia.

Table 2 Differences in Asthenopia Incidence Rates

Faculty	Symptom				Total	*p value*
	Asthenopia		*Bukan Asthenopia*			
	n	%	n	%		
Faculty Medicine	226	86.26	36	13.74	262	0.377
Faculty of Engineering	70	82.35	15	17.65	85	

Table 2 shows the results of the Chi-Square test with a significance value of 0.377 greater than alpha 5%, then H0 is accepted, which means that there is no difference in the incidence rate of asthenopia between students of the Faculty of Medicine and the Faculty of Engineering, Tarumanagara University.

Table 3 Corelations between the duration of using a laptop and the incidence of asthenopia

Laptop Usage Duration (Hours Per Day)	Symptom				Total		*p value*
	Asthenopia		*Not Asthenopia*				
	n	%	n	%	n	%	
< 2 jam	3	100	0	0	3	0.122	
2-4 jam	22	73.33	8	26.67	30		
> 4-6 jam	92	82.88	19	20.65	111		

Table 3 shows the Chi-Square test results with a significance value of 0.122, greater than alpha 5%, then H0 is accepted. It means that there is no correlation between the duration of staring at a laptop screen and the symptoms of asthenopia.

DISCUSSION

Duration of Laptop Use at the Faculties of Medicine and Engineering

Students of the Faculty of Medicine, Tarumanagara University, have been learning fully online since the COVID-19 pandemic until data collection, as well as students from the Faculty of Engineering. This leads to increased use of laptops. The duration of hours per day spent staring at a laptop's digital screen as a whole is dominated by more than 6 hours (58,50%), followed by 4-6 hours (31,99%) and 2-4 hours (8,65%). As many as 90,39% of respondents spend more than 4 hours staring at a laptop screen studying. This does not include using laptops for purposes besides learning or using other gadgets besides laptops. The amount of time spent in front of a laptop tends to be a factor in eye disorders (Agarwal *et al.*, 2013; Rosenfield, 2011). This is in line with the research of Bahkir & Grandee (2020) on an average increase in the use of gadgets with a duration of 4.8 ± 2.8 hours per day, so the total number of screen times per day is 8.65 ± 3.74 hours (Bahkir & Grandee, 2020).

Prevalence of Asthenopia in the Faculty of Medicine and the Faculty of Engineering

The results revealed that the prevalence of asthenopia in students of the Faculty of Medicine was 86,26% and in the Faculty of Engineering was 82,35%. The total the incidence rate of asthenopia is 85,30%. This is also supported by the large amount of screening time spent by students of the Faculty of Medicine and in the Faculty of Engineering. The results of this study are in accordance with Logaraj *et al.* (2014) that the prevalence in the Faculty of Medicine is 78,6% and in the Faculty of Engineering is 81,9% with a total prevalence in both faculties of 80,3% (Logaraj, Madhupriya and Hegde, 2014).

The results of this study are also in line with the results of previous research by Gumunggilung *et al.* (2021) which stated that the incidence rate of asthenopia in students during the COVID-19 pandemic was 82,4% (Gumunggilung *et al.*, 2021). The number in this study is smaller than that reported by Bahkir & Grandee (2020) which is 95,8% (Bahkir & Grandee, 2020).

The statistical test results showed that there was no difference in the incidence rate of asthenopia between students of the Faculty of Medicine and the Faculty of Engineering, Tarumanagara University. It is because during the online learning, 98,10% students of the Faculty of Medicine and 92,94% of the Faculty of

Engineering spent >2 hours studying by a laptop. This is in line with Logaraj *et al.* (2014) that the prevalence in both faculties is almost the same (Logaraj, Madhupriya and Hegde, 2014).

The Correlation between Laptop Users and Asthenopia

The results of the Chi Square test showed no correlation between the duration staring at the laptop screen and the symptoms of asthenopia. This is different from the research conducted by Ni Made Ernita Refayanti *et al.* (2022) which proved a correlation between the duration of laptop use and the incidence of asthenopia (Ni Made Ernita Refayanti *et al.* , 2022) . However, some previous studies from Sawaya *et al.* (2020) showed no significant correlation between laptop usage time and asthenopia (Sawaya *et al.*, 2020) . Another study from Abuallut *et al.* (2022) also showed results that the duration of use of digital tools, including laptops, is not significantly related to asthenopia (Abuallut *et al.*, 2022) . According to a study in North India, which proved that even the use of gadgets is more than 2 hours a day, it can cause asthenopia (Mohan *et al.* , 2020) . Referring to the results of the study, that the longer the use, the greater the occurrence of asthenopia, but asthenopia can occur if it passes a certain period.

CONCLUSION

Based on the study results, it can be concluded that the prevalence of asthenopia among the students in the Faculty of Medicine, Tarumanagara University is high, which is 86,26%. At the Faculty of Engineering, it is 82,35%. Then, there is no difference in the incidence rate of asthenopia between students of the Faculty of Medicine and the Faculty of Engineering at Tarumanagara University. It is because the online learning of students in the Faculty of Medicine is 98,10%, and in the Faculty of Engineering, 92,94% spend more than two hours studying using a laptop. In addition, there is no correlation between the duration of staring at a laptop screen and the symptoms of asthenopia.

Further research needs to be carried out to see if there is a difference in the incidence rate of asthenopia along with changes in learning methods carried out in a hybrid manner, conduct studies and develop more specific research ideas on comparing the prevalence of asthenopia in groups that take preventive measures and those that do not take preventive measures. Socialization about the prevention of asthenopia needs to be done, not only for students but also for the general public, due to the increasingly common use of digital devices for daily activities.

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