Contents lists available at IOCS

Science Midwifery

journal homepage: www.midwifery.iocspublisher.org

The effect of eye exercise on eye fatigue in information technology study program students at the Muhammadiyah University of North Sumatra

Widyawati[1], Nurhaida[2], Havija Sihotang[3], Elvi Susanti Lubis[4], Riny Apriani[5], Puput Melati Hutauruk[6], Syahfira Ananda Syahna[7], Ardiansyah[8]

[1,2,3,4,5,6,7]Sekolah Tinggi Ilmu Kesehatan Binalita Sudama, Indonesia
[8]Universitas Islam Negeri Sumatera Utara, Indonesia

ARTICLE INFO

Article history:

Received Jan 12, 2025
Revised Jan 16, 2025
Accepted Jan 20, 2025

Keywords:

Eye Exercises
Eye Fatigue
Student

ABSTRACT

In the world of lectures, the use of computers is very popular among students, because computers help with assignments, search for information, communicate and others. However, if the use of computers is carried out for a long period of time, it will cause tension in the eye muscles, which can cause eye fatigue. Efforts to prevent eye fatigue are by doing eye exercise movements to improve the ability of the nerves and eye muscles. This study aims to analyze the difference in the mean value of eye fatigue between the treatment group and the control group towards reducing the level of eye fatigue in students of the Information Technology Study Program at the Muhammadiyah University of North Sumatra. This study is an experimental study using a randomized pre-posttest control group design. The study was conducted at the Muhammadiyah University of North Sumatra. A sample of 30 people was randomly selected to select research subjects. The research subjects numbered 15 people in the treatment group who were given eye gymnastics and 15 people in the control group without being given eye gymnastics. The level of eye fatigue was measured using an eye fatigue questionnaire consisting of 9 questions about symptoms of eye fatigue. Data analysis used a paired t-test. The results showed that there was a significant difference in the mean eye fatigue in the treatment group. The difference test of the pre-test and post-test scores of the two groups also showed that there was a significant difference in scores of 2.13 with a p value of 0.00 in the treatment group ($p < 0.05$), while the p value was 0.15 in the control group ($p > 0.05$). This proves that eye exercise has an effect on reducing the level of eye fatigue in students. It is concluded that eye exercise can reduce the level of eye fatigue in students.

Corresponding Author:

Widyawati,
Sekolah Tinggi Ilmu Kesehatan Binalita Sudama,
Jl. Pancing Ps. 5 No.1, Petisah Tengah, Kec. Medan Petisah, Kota Medan, Sumatera Utara 20236, Indonesia
Email: widyawatibsm@gmail.com

INTRODUCTION

The development of science and technology has become more advanced. Especially computer technology, this technology is one that is developing quite rapidly and has many enthusiasts. This has both positive and negative impacts on its users.

In the world of lectures, the use of computers is very popular among students, because computers help with assignments, searching for information, communicating and so on. However, if the use of gadgets for a long time will have an impact on eye health, such as tired eyes (Hendra & Octaviani D, 2017).

Nowadays, students are prone to eye fatigue, this is due to the use of computers for academic purposes, social networking and for recreation. Eye fatigue is a condition of eye fatigue caused by the eye muscles that make accommodation work extra and over time the eye muscles contract (Gondhowiardjo, 2009) .

Based on a recent study published by The Vision Council (2015), it was shown that gadget use on health has impacts such as tired eyes by 32.8%, dry eyes by 22.8%, blurred vision by 23.3% and body disorders by 21.1%.

Eye fatigue occurs from childhood to late adulthood. Eye fatigue is caused by working in front of a computer, watching videos on a smartphone, reading and so on. A preliminary study conducted at the Muhammadiyah University of North Sumatra, Computer Technology Study Program on students using the interview method of 10 people, found that the majority of students felt symptoms of eye fatigue such as sore eyes, feeling heavy, sore shoulders and neck, and sometimes feeling dizzy when in front of the monitor for a long time. Students also said they often forget the time when in front of the computer, especially when working on assignments and practicing in the computer laboratory. On average, students are in front of the monitor for more than 2 hours, especially when working on assignments to create programs.

Based on the results of interviews with students who experienced symptoms of tired eyes, to reduce the symptoms of tired eyes, various methods were used, namely resting (stopping in front of the monitor), massaging the area around the eyes, looking at green things and sleeping.

Tired Eyes are symptoms felt in the eyes due to excessive use of gadgets for hours. This eye fatigue is related to the eye muscles, one of which is the ciliary muscle (Dhote, 2015). Tired eyes are caused by various factors, both external and internal. External factors such as gadget radiation, light from the monitor, the intensity of computer use that causes tired eyes, while internal factors are age and refractive disorders (Oei, 2006). Another factor that causes symptoms of tired eyes is the lighting from the monitor or a room that is too bright which can cause glare that can cause tired eyes, so appropriate lighting is needed to prevent eye fatigue. Lighting that is too dim can make the eyes work harder to see. Lighting or lighting settings greatly affect gadget users, making their eyes tired quickly (Subitha, 2013). Gadget users also turn out to blink less often when in front of the monitor. Blinking is very important to reduce the risk of dry eyes. The longer the eyes are open, the higher the possibility of the cornea becoming dehydrated, feeling hot and sore, or like there is sand in the eyelids until it feels heavy (Berliana & Rahmayanti, 2017). Complaints of tired eyes can be reduced by doing several things such as using eye drops as pharmacological therapy and using a screen monitor, as well as eye exercises as non-pharmacological therapy.

Eye exercise is a technique for training the eye muscles to relax the eyes and prevent several eye problems (Di Noto et al., 2013). The benefits of this eye exercise, in addition to reducing eye fatigue, can reduce wrinkles in the eye area which makes the eye muscles strong and can sharpen vision (ARISANDI, 2018). Reducing the symptoms of tired eyes can be done with eye exercises with 7 (seven) stages starting from palming to coldPad, where these movements not only reduce tired eyes, these movements are very beneficial for eye health if done routinely for 1 (one) day (Horwood et al., 2014).

Eye exercise can be used as one of the interventions or ways to reduce complaints of eye fatigue. In addition to being very easy to do, it does not require a special place, can be done alone,

does not cost money and does not take a long time. Students can do it when they feel tired eyes from staring at a computer or cellphone screen continuously. Eye exercise can be done for approximately 10 minutes, then the eyes will relax again and not dry.

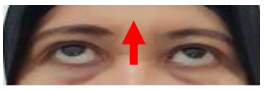
RESEARCH METHOD

This study is an experimental study using a pre-posttest control group design. The intervention group was given eye exercise treatment, the control group was not given intervention. Both groups were given pre-test and post-test on complaints of eye fatigue. This study was located at the Faculty of Computer Science and Information Technology, Information Technology Study Program, University of Muhammadiyah North Sumatra.

The research sample consisted of 30 healthy students who complained of eye fatigue, without medical eye disease, no history of applying eye medication, and no experience of overcoming eye fatigue with eye exercise. The research sample was divided into 2 groups, namely 15 people in the intervention group and 15 people in the control group.

Before the eye exercise was conducted, researchers and members conducted a pre-test on complaints of eye fatigue in the control group and intervention group by giving a questionnaire. The eye exercise intervention was conducted simultaneously with 15 people in the intervention group guided by the researcher. The level of eye fatigue was measured based on four categories, namely mild, moderate and severe eye fatigue. Eye fatigue in students was measured using an eye fatigue questionnaire adopted from previous research consisting of 9 questions about symptoms of eye fatigue that had been validated (Joshi et al., 2017)(Gosewade et al., 2016).

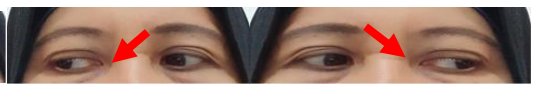
This study was conducted for 1 week with 3 face-to-face meetings. Each meeting was conducted four times with seven different movements and each movement had a duration of 5-10 seconds (Jannah, 2012). Eye exercise treatment was carried out simultaneously with 15 people in the treatment group guided by the researcher. Data collection for the pre-test of eye fatigue in both groups was conducted at the first meeting at the beginning of the week. Data collection for the post-test of eye fatigue in both groups was conducted at the last meeting. This study was assisted by a leaflet of seven eye exercise movements to make it easier for students to memorize the movements. (attached). The seven eye exercise movements can be seen in Figure 1



Movement 1: Head straight forward. Direct your gaze upwards (ceiling), then look at the floor.

Movement 2: Move your eyeballs left and right. Try as if you want to see

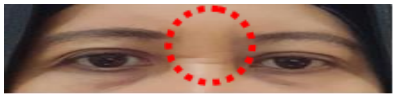
Movement 3: Move the eyeballs up. Hold the eyeballs up. Then move them to the upper left and upper right.



Movement 4: Move the eyeballs down and hold them below. Then move the eyeballs to the bottom left and bottom right

Movement 5. Move the ball starting from the top left corner to the bottom right corner.

previous movement, but start from the bottom left corner to the top right corner.



Movement 7: Rotate the eyeballs to the left clockwise. Then, rotate the eyeballs to the right, counterclockwise. All in all 5 – 10 times

Figure 1. Eye exercise movements

Data analysis in this study used univariate analysis which aims to explain the characteristics of the research subjects such as age, viewing distance, time using the computer, and eye rest and to explain the frequency distribution of eye fatigue data. The second data analysis used bivariate analysis using the unpaired t-test or difference test to determine the average value of eye fatigue in the intervention group and the control group after doing eye exercise on reducing the level of eye fatigue.

RESULTS AND DISCUSSIONS

This study conducted univariate analysis to describe general eye fatigue data based on the results of the pre-test and post-test of eye fatigue in the treatment group and the control group. This univariate analysis aims to display the level of eye fatigue experienced by students before and after doing eye exercises in the treatment group and the control group.

Factors related to eye fatigue in the treatment group and control group

To see the factors related to eye fatigue in students for the treatment group and control group, which consist of age factors, viewing distance, length of exposure to the computer and refractive disorders can be seen in Table 1.

Table 1. Factors related to eye fatigue in students in the Information technology study program, Muhammadiyah University in 2023

No	Factors related to eye fatigue	Treatment Group		Control Group	
		f	%	f	%
Age					
1	19	2	13.3	2	13.3
2	20	10	66.7	9	60.0
3	21	3	20.0	4	26.7
Visibility					
1	According to standards (more than 60 cm)	10	66.7	12	80.0
2	Not up to standard (< 60 cm)	5	33.3	3	20.00
Exposure Time with computer					
1	> 4 hours/day	7	46.7	6	40.0
2	Less than 4 hours/day	8	53.3	9	60.0
Every 1 hour rest your eyes for 10 minutes					
1	Yes	9	60.0	9	60.0
2	No	6	40.0	6	40.0

Table 1 shows that in the treatment and control groups, the majority of respondents were aged 20 years with a total of 66.7% and 60%. The majority of respondents' vision distance was more than 60 cm, namely 66.7% in the treatment group and 80% in the control group. Rama worked on average on the computer > 4 hours / day as much as 46.7% for the treatment group and 40% for the control group. Respondents in the treatment group and the control group did not rest their eyes every 10 minutes every hour, namely 40%. 40% of respondents used glasses in both the treatment and control groups

Eye fatigue before and after giving Eye Exercises

Pre-test measurements were conducted before administering Eye Exercises treatment at the first meeting. Post-test measurements were conducted after administering Eye Exercises treatment at the last meeting or the sixth meeting. To see the distribution of students' eye fatigue before and after administering Eye Exercises in the treatment group and control group, it can be seen in table 2.

Table 2. Distribution of eye fatigue in students before and after giving eye exercises to students in the information technology study program, Muhammadiyah University in 2023

Fatigue Eye	Treatment Group				Control Group			
	pretest		posttest		pretest		posttest	
	n	%	n	%				
Light	0	0	7	46.7	3	20.0	4	26.7
Currently	9	60	8	53.3	8	53.3	7	46.6
Heavy	6	40	0	0	4	26.7	4	26.7
Amount	15	100	15	100	15	100	15	100

Table 2 shows that in the treatment group, eye fatigue of students before the eyes exercise was carried out, eye complaints were in the moderate category of 60% and severe of 40% while after the eyes exercise was carried out, eye fatigue was in the moderate category of 53% and mild of 46.7%. In the control group, eye fatigue of students before the eyes exercise was carried out was mostly in the moderate category of 53.3% while after without the eyes exercise, the most was in the moderate category of 46.6%.

Difference in eye fatigue before and after doing Eye Exercise

The difference in eye fatigue before and after Eye Exercise in the treatment group and control group can be seen in Table 3.

Table 3. Distribution and average score of eye fatigue in information technology study program students, Muhammadiyah University in 2023

	Treatment Group				Control Group			
Variables	Mean	SD	SE	p value	Mean	SD	SE	p value
- Pre-test	14.13	1,727	0.446	0,000	13.20	2,042	0.527	0.015
- Post test	11.47	1,457	0.376		13.73	1,624	0.419	

Table 3 shows the mean value of pre-test eye fatigue in the treatment group of 14.13 with a standard deviation of 1.727 and the mean value of post-test eye fatigue in the treatment group of 11.47 with a standard deviation of 1.457. It can be seen that the mean difference between the pretest and posttest measurements is 2.66 with a standard deviation of 0.27. The results of the statistical test obtained a p value = 0.00, so it can be concluded that there is a significant difference between the pretest and posttest measurements.

The mean value of pre-test eye fatigue in the control group was 13.20 with a standard deviation of 2.042 and the mean value of post-test eye fatigue in the control group was 13.73 with a standard deviation of 1.624. It can be seen that the mean difference between the pretest and posttest measurements is 0.53 with a standard deviation of 0.48. The results of the statistical test obtained a p value = 0.015, so it can be concluded that there is a significant difference between the pretest and posttest measurements in the control group.

The difference in eye fatigue levels in students in the treatment group and control group can be seen in Table 4.

Table 4. Differences in eye fatigue levels in information technology study program students at Muhammadiyah University in 2023

Variables	Average		Difference Mark	p-value
	Treatment	Control		
- Pre-test	14.13	13.20	0.93	0.02
- Post test	11.47	13.73	2.26	0.00

Table 4 shows that the average pre-test eye fatigue between the treatment group and the control group did not have a significant difference as seen from the difference in the values of the two groups which were not much different, namely 0.93 with a p value = 0.02. Meanwhile, the average post-test eye fatigue between the treatment group and the control group did not have a significant difference as seen from the difference in the values of the two groups of 2.26 with a p value of, 000, which means that the two groups have different levels of fatigue.

The Effect of Eye Exercise on Reducing Eye Fatigue Levelsin the Treatment Group and Control Group

The effect of eye exercise on reducing eye fatigue levels in the treatment group and control group can be seen in table 5.

Table 5. Difference test of mean values of eye fatigue in students

Group	Average		Difference Mark	Different Difference in Value	p-value
	Pre-test	Post test			
- Treatment	14.13	11.47	2.66	2.13	0.00
- Control	13.20	13.73	0.53		0.15

Table 5 shows the difference in the mean values of pre-test and post-test of eye fatigue in the treatment group and the control group. The difference in the mean values of pre-test and post-test of the treatment group is 2.66. While in the control group the difference in the mean values of pre-test and post-test is 0.53. The results of the difference test of the pre-test and post-test values of the two groups also show that there is a significant difference in the value of 2.13. Based on the statistical test, the p value is 0.00 in the treatment group ($p < 0.05$), while the p value is 0.15 in the control group ($p > 0.05$). Based on this statistical test, it proves that eye exercise has an effect on reducing the level of eye fatigue in students.

Discussion

Eye Fatigue Before and After Giving Eye Exercises to Students.

Based on the results of the study on students in both the treatment group and the control group often experienced symptoms of eye fatigue such as pain, dizziness, red eyes, watery eyes, stinging, tension, and often blurred when using a computer. However, after doing eye exercises in the treatment group, the complaints of eye fatigue experienced were not as severe as the previous complaints, this is evidenced by the results of the study that after doing eye exercises, the treatment group only experienced moderate and mild fatigue. On the other hand, in the control group, complaints of eye fatigue were still the same as before, even all respondents in this group still experienced severe eye fatigue.

The time factor of giving the eyes a rest every 1 hour for 10 minutes has an effect on reducing eye fatigue, where 60% of respondents have rested their eyes. This is because giving the eyes a rest can break the chain of eye fatigue. Age factors can also affect the reduction of eye fatigue, where the respondents are 19-21 years old and have not experienced a decline in physiological function, so if therapy is given it can still be seen compared to the age of 25-39 years, this is because during that period there will continue to be a decline in physiological function of the muscles around the eyes.

Difference in eye fatigue before and after doing Eye Exercises

The results of this study indicate that there is a difference in the mean value and the difference in the mean value of eye fatigue between the two groups, thus proving that Eyes Exercise has an effect on reducing the level of eye fatigue of students. By doing eye exercise or eye gymnastics four times a day routinely and carried out in six meetings, the treatment group experienced a significant decrease in the mean value of eye fatigue compared to the control group, so that the difference in the mean value between the two groups was significantly different.

The results of this study are in line with research conducted by Joshi and Retharekar (2017) explaining that efforts to improve eye health are by doing exercise therapy. Eye exercises are explained to be able to improve eye ability, sharpen vision, make eye muscles elastic and strong, and can sharpen vision. Eye exercises are one of the most effective and efficient preventive efforts to reduce eye fatigue experienced by wig workers, because eye exercises are easy to do and do not require a special place, a lot of money, and a long time (Di Noto et al., 2013).

The results of the study showed that the complaints of eye fatigue experienced by students improved after they did eye exercises or eye gymnastics after six meetings. Eye exercises can reduce eye fatigue because eye exercise movements can restore the elasticity of the eye accommodation muscles and reduce intensive stress on eye function. Students felt that their eye disorders decreased and improved when they did eye exercises regularly. The results of this study are in line with research conducted by Sulistiyani et al. (2012) namely eye exercises can reduce the level of eye fatigue in false eyelash workers who were carried out in four meetings (Sulistiyani, 2013).

Eye fatigue is a disturbance in visual function caused by the forced use of the sense of sight for a long period of time, causing intensive stress on the eye's accommodation muscles.

Eye fatigue is usually characterized by an uncomfortable view and not focused on a particular object. Eye fatigue experienced by students of information technology study programs can be caused by work factors and also individual factors. The work factors in question are such as the type of work or work object, namely always using a computer in every lecture, especially during laboratory practice and when doing assignments.

Tension in the eye muscles can occur if the eyes are forced to focus on an object for a long time and done monotonously or repeatedly. Eye fatigue experienced by students is caused by the eyes being forced to work excessively on small work objects and worked on monotonously, resulting in a decrease in the accommodation power of the eye muscles which causes disturbances in visual function (Indrakila et al., 2023).

Based on the results of the study, both the treatment group and the control group often experienced symptoms of eye fatigue such as watery eyes, sore, dry, tense, and often blurry. However, after doing eye exercises in the treatment group, the complaints of eye fatigue experienced were not as severe as the previous complaints, this is proven by the results of the study that after doing eye exercises, the treatment group only experienced moderate and mild fatigue. On the other hand, in the control group, complaints of eye fatigue were still the same as before, even all students in this group still experienced severe eye fatigue.

The results of this study are also supported by the theory put forward by Jannah (2012), that by doing eye exercises, it can make the eye muscles and the surrounding area elastic and strong, as well as sharpen vision and improve eye function. The more often we do eye exercises, the stronger the muscles in the eyes will be to restore better vision function (Joshi et al., 2017).

Eye fatigue before giving Eye Exercises to Students, the results of the data obtained in both groups where, the majority experienced eye fatigue in the moderate category. The average age of respondents is in the age range of 19-21 years. The moderate level of visual fatigue is the level at which respondents will experience visual impairment. At a moderate level, where the symptoms felt have begun to experience discomfort in vision and interfere with concentration due to

symptoms of eye fatigue such as sore eyes, pain, slight dizziness, and blurred vision (Maharja, 2015).

In the study of Bansal and Moudgil (2014)(Maulina & Syafitri, 2019) stated that 90% of human daily activities are more in front of the monitor. The journal also stated, 57 the majority who often complain of headaches and tired eyes (Asthenopia) are students aged 18-25 years. This statement is in line with the research conducted by Han et al (2013)(Gopinathan et al., 2012) entitled "Prevalence of asthenopia and its risk factors in Chinese college students" that students are at high risk of experiencing asthenopia because most of them have experienced the process of functional maturation of the visual system which makes the students' ocular tissue more sensitive to environmental changes compared to other populations. Moreover, students are required to be able to master science and technology and utilize technology to complete assignments and increase their knowledge (Lertwisuttipaiboon et al., 2017).

The duration of computer exposure also affects the incidence of eye fatigue (asthenopia). Based on table 4.1, it was found that the duration of computer use was more than 4 hours as much as 46.7% for the treatment group and 40% for the control group. 40% of respondents did not rest their eyes. The intensity of computer use by all respondents was said to exceed the duration of use that should be. The limit of gadget use should not be more than 2 hours a day, because it can have a bad effect on health and this can be at risk of eye fatigue. When working in front of a monitor, it is better to look at the screen every 20 minutes to divert your gaze and rest for 20 minutes, this can prevent the risk of eye fatigue. The results of this study also showed that all respondents used computers more than normal limits, so that respondents experienced eye fatigue (Juliana Lumban Gaol et al., 2018).

Eye fatigue occurs because the longer the interaction with the monitor screen will cause the physiological ability of the muscles around the eyes to decrease, which can cause eye fatigue (Ansharieta et al., 2020). The intensity of laptop use is closely related to eye fatigue, considering the duration of direct eye interaction with the laptop monitor. Using a laptop for a long time but not in frequent frequency will still cause symptoms of mild eye fatigue, especially in use with long intensity and frequent duration. The higher the duration of laptop use, the higher the risk of experiencing eye fatigue.

The Effect of Eye Exercises on Tired Eyes in Students

The average result of eye fatigue in the treatment group before the intervention was 14.3, while in the post-test results or after the eye exercises, the average eye fatigue was 11.47. Where there is a decrease in eye fatigue before and after the intervention. The results of the data test with an unpaired t-test or difference test, where the p-value is 0.000, which means there is an effect of eye fatigue after the administration of eye exercises on students (Kim, 2016).

This is possible because after the intervention was completed, many respondents felt their eyes were more comfortable and fresher. This eye fatigue condition occurs when the eyes are formed to receive stimuli from light beams on the retina, then through the optic nerve fibers, divert this stimulus to the center of vision in the brain to be interpreted. The eye has a mechanism so that incoming light beams fall right on the retina, namely by accommodation. Accommodation carried out by the ciliary muscles and extraocular muscles can experience fatigue if it continues, especially when looking at small objects and close distances, so that reducing eye fatigue can be done by breaking the chain of eye fatigue in the subject, because if left untreated it will interfere with activities (Kumar et al., 2014).

The decrease in tired eyes in students with the provision of eye exercises intervention is because some movements of the eye exercises can make respondents feel the symptoms of tired eyes decrease (Dwiyana, 2019)(SALFIA et al., 2019)(Solikah & Hasnah, 2022)(INES & DYANEL, 2023). Based on the respondents' statements, these movements are felt to make the eyes relax, comfortable, and fresh. Asthenopia (eye fatigue), can occur due to fatigue of the extraocular and intraocular eye muscles, where symptoms such as those usually occur due to a lack of blinking

reflex which makes the eyes dry, resulting in a sensation of irritation in the conjunctiva. This eye muscle fatigue can also occur due to eye muscles experiencing spasms and due to the accumulation of lactic acid in the muscles and blood, resulting in tired eyes, ocular pain, and impaired vision.

CONCLUSION

Eye fatigue before Eye Exercise in the treatment group was moderate and severe fatigue, while eye fatigue after Eye Exercise was mild and moderate fatigue., kEye fatigue before and after without doing Eye Exercise in the control group was moderate and severe fatigue, athere is a difference in eye fatigue before and after Eye Exercise in the treatment group and control group, aand the effect of Eye Exercise on reducing the level of eye fatigue in the treatment group and control group.

References

Ansharieta, R., Effendi, M. H., & Plumeriastuti, H. (2020). Detection of multidrug-resistant (MDR) Escherichia coli isolated from raw milk in East Java Province, Indonesia. *Indian Journal of Forensic Medicine & Toxicology*, *14*(4), 2287–2291.

ARISANDI, I. P. (2018). *Efektivitas Senam Mata Terhadap Computer Vision Syndrome (CVS)*.

Berliana, N., & Rahmayanti, F. (2017). Faktor-faktor yang berhubungan dengan keluhan kelelahan mata pada pekerja pengguna komputer di Bank x kota Bangko. *Jurnal Kesehatan Terpadu*, *1*(2).

Dhote, S. A. (2015). Eye exercises-An eyesight rejuvenation therapy. *World Journal of Pharmaceutical Research SJIF Impact Factor*, *5*(990), 6.

Di Noto, P., Uta, S., & DeSouza, J. F. X. (2013). Eye exercises enhance accuracy and letter recognition, but not reaction time, in a modified rapid serial visual presentation task. *PloS One*, *8*(3), e59244.

Dwiyana, K. (2019). PENURUNAN KECEMASAN DENGAN SENAM HAMIL PADA ASUHAN KEPERAWATAN IBU HAMIL TRIMESTER 3. *DIII Keperawatan*.

Gondhowiardjo, T. D. (2009). *Pengaruh Bermain Komputer Pada Kesehatan Mata Anak-Anak*. Jakarta: Ilmu Penyakit Mata RS. Cipto Mangunkusumo.

Gopinathan, G., Dhiman, K. S., & Manjusha, R. (2012). A clinical study to evaluate the efficacy of Trataka Yoga Kriya and eye exercises (non-pharmocological methods) in the management of Timira (Ammetropia and Presbyopia). *AYU (An International Quarterly Journal of Research in Ayurveda)*, *33*(4), 543–546.

Gosewade, N., Drugkar, A., & Shende, V. (2016). Effect of pranayama and eye exercises on visual acuity of medical students: a case control study. *International Journal of Contemporary Medical Research*, *3*(4), 1133–1136.

Hendra & Octaviani D, F. (2017). *Keluhan kesehatan akibat penggunaan laptop pada mahasiswa FKM UI*. Diperoleh pada.

Horwood, A. M., Toor, S. S., & Riddell, P. M. (2014). Change in convergence and accommodation after two weeks of eye exercises in typical young adults. *Journal of American Association for Pediatric Ophthalmology and Strabismus*, *18*(2), 162–168.

Indrakila, S., Malda, M. I., Soewoto, W., Purnomo, J., Sungkar, A., Agustriani, N., & Saputra, A. R. (2023). Pendekatan Deteksi Dini Retinoblastoma pada Anak di RSUD Moewardi Surakarta. *Jurnal Kreativitas Pengabdian Kepada Masyarakat (PKM)*, *6*(9), 3514–3521.

INES, F., & DYANEL, S. (2023). *Efektivitas Brain Gym Terhadap Konsentrasi Belajar Siswa Di Smpn 19 Makassar*. STIK Stella Maris Makassar.

Joshi, H., Retharekar, S., Rairikar, S., Shyam, A., & Sancheti, P. (2017). Effect of Eye Exercises on the Visual Acuity and Refractive Error of Myopics. *International Journal of Therapies and Rehabilitation Research*, *6*(2), 249.

Juliana Lumban Gaol, M., Camelia, A., & Rahmiwati, A. (2018). Risk Factors Analysis for Fatigue in Production Departement Employees of PT. Arwana Anugrah Keramik, Tbk. *Jurnal Ilmu Kesehatan Masyarakat*, *9*(1), 53–63.

Kim, S.-D. (2016). Effects of yogic eye exercises on eye fatigue in undergraduate nursing students. *Journal of Physical Therapy Science*, *28*(6), 1813–1815.

Kumar, M. A., Rajalakshmi, A. R., & Kumbhat, M. (2014). Effect of yoga eye exercise on medical college students with refractive error. *J Curr Trends Clin Med Lab Biochem*, *1*, 1006.

Lertwisuttipaiboon, S., Pumpaibool, T., Neeser, K. J., & Kasetsuwan, N. (2017). Effectiveness of a participatory

eye care program in reducing eye strain among staff computer users in Thailand. *Risk Management and Healthcare Policy*, 71–80.

Maharja, R. (2015). Analisis tingkat kelelahan kerja berdasarkan beban kerja fisik perawat di instalasi rawat inap rsu haji surabaya. *The Indonesian Journal of Occupational Safety and Health*, *4*(1), 93–102.

Maulina, N., & Syafitri, L. (2019). Hubungan Usia, Lama Bekerja Dan Durasi Kerja Dengan Keluhan Kelelahan Mata Pada Penjahit Sektor Usaha Informal Di Kecamatan Banda Sakti Kota Lhokseumawe Tahun 2018. *AVERROUS: Jurnal Kedokteran Dan Kesehatan Malikussaleh*, *5*(2), 44–58.

Oei, G. D. (2006). *Terapi mata dengan pijat dan ramuan*. Penebar Swadaya.

SALFIA, M., Hermansyah, H., Lestari, W., Novira, D., & Annisa, R. (2019). *Pengaruh Senam Tai Chi Dan Guided Imagery Terhadap Penurunan Depresi Pada Lansia Di Balai Pelayanan Dan Penyantunan Lanjut Usia (Bpplu) Kota Bengkulu Tahun 2019*. Poltekkes Kemenkes Bengkulu.

Solikah, S. N., & Hasnah, K. (2022). *Monograf Senam Mata untuk Pencegahan Miopia*. Penerbit NEM.

Subitha, M. (2013). Pengaruh Komputer Terhadap Kesehatan Mata. *Jakarta: Universitas Guna Dharma*.

Sulistiyani, A. T. (2013). *Efektivitas Senam Mata Untuk Mengurangi Tingkat Kelelahan Mata Pada Pekerja Bulu Mata Palsu Di Desa Pengadegan Kecamatan Pengadegan Kabupaten Purbalingga*. UNIVERSITAS MUHAMMADIYAH PURWOKERTO.