

Effect of Eye Exercise Therapy on Asthenopia Symptoms Among Islamic Boarding School Students in Cirebon: A Quasi-Experimental Study

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ABSTRACT

Background: There are 2.2 billion people worldwide experiencing eye disorders, with 510 million suffering from untreated vision impairment, and Indonesia is a significant contributor to this issue. Asthenopia is a symptom caused by eye strain, which can lead to vision impairment. This study aims to assess the effect of eye exercise therapy on symptom of asthenopia.

Methods: This research was a quasi-experimental study with a non-equivalent pretest-posttest control group design. The study was conducted at the As-Sunnah Islamic Boarding School in Cirebon, West Java for two months, involving 40 students selected based on inclusion criteria. Subjects were given the Visual Fatigue Index Questionnaire to assess symptoms of asthenopia. Ethical approval was obtained from the Ethics Committee of the Faculty of Pharmacy, YPIB University, No. 111/KEP/EC/IV/2024. Informed consent was provided by the subjects through a 35-item consent form.

Results: Eye exercise therapy has a significant effect on asthenopia symptoms, as evidenced by the Paired Sample T-Test results (p value < 0.05 with the average Visual Fatigue Index (VFI) score decreasing from 0.49 (pre-test) to 0.37 (post-test) in the intervention group, while the control group showed no significant change (0.48 pre-test to 0.49 post-test).

Conclusion: Eye exercise therapy has an effect on Asthenopia symptoms. Future research is recommended to explore the use of eye exercise therapy for refractive eye disorders.



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INTRODUCTION

Health is considered important, and poor care may cause physical health problems, one of which is problem regarding eye function. The two eyes have separate structures but function as a pair, making it possible for someone to see with only one eye, but three-dimensional vision can be impaired because the eye muscles work harder, especially those related to judging the distance of an object. One of the consequences of weakening of the eye muscles is eye fatigue or asthenopia (Munif et al., 2020).

Asthenopia is one of eye problems due to the eye muscles are forced to work hard when looking at close, small objects, for a long time, lack of lighting and lack of rest or sleep. The symptoms of asthenopia include blurred vision, dry eyes, musculoskeletal symptoms (neck, shoulder, back pain) and psychosocial problems (Munif et al., 2020). Asthenopia and visual impairment are significant global health concerns, affecting 2.2 billion people, with 510 million experiencing untreated hypermetropia. Indonesia ranks third in contributing to visual impairment after India and China (WHO, 2023). In Asia, the prevalence of asthenopia is notably

high, reaching 89.9% in Malaysia and 53.5% in China (Sawaya et al., 2020; Abuallut et al., 2022). These conditions negatively impact quality of life by limiting educational and employment opportunities and imposing financial burdens on individuals, families, and communities."

Even though asthenopia is considered trivial, it must be treated. Eye health due to asthenopia can be managed with pharmacological and non-pharmacological treatment. Pharmacological treatment can be administered with Lubricating Eye Drop (LED), but this is not recommended because of side effects in the form of allergies and increased eye strain (Djing, 2007).

One of the non-pharmacological therapies for asthenopia is eye exercise therapy since it can relax the eye muscles to make them elastic and strong, reduce eye disease, and sharpen vision by moving them carefully, parallelly and repeatedly (Di Noto et al., 2013). Eye exercise therapy has benefits for eye health since it can increase blood circulation, prevent vision problems, sharpen vision, reduce tension and relax eye muscles, prevent the formation of eye tumors in the pituitary gland, and reduce wrinkles in the area around the eyes (Arisandi, 2018). Based on previous studies, eye exercises were effective in preventing myopia among elementary school-aged children (Arisandi, 2018) as well as for adults who worked as tailors (Sucipto et al., 2020).

The United Nations' Sustainable Development Goals (SDGs) are a global call to take steps in creating a healthier world for people and the environment by 2030. These 17 goals are interrelated, meaning that actions in one area will influence outcomes in other areas, including the 4th goal namely optimal vision allows children to reach their maximum potential throughout life. A previous study revealed that school-aged children with visual impairment tended to had lower level of educational achievement (*Eye Health and the Sustainable Development Goals*, 2025).

Asthenopia often occurs in school-aged children, especially in Islamic boarding schools because they have many activities related to the eyes, such as reading books, reading scriptures, memorizing and reading the Quran in small letters or writing. Asthenopia in Islamic boarding schools often has poor treatment since it is considered a normal complaint without any dangerous impact on health. Based on a preliminary study conducted by researchers, it was found that 60% of students at the As-Sunnah Islamic boarding school of Cirebon experienced symptoms of asthenopia with a Vision Fatigue Index (VFI) score of ≥ 0.40 and there was no solution to such problem. Therefore, this study aims to determine the effect of eye exercise therapy on asthenopia symptoms in students of As-Sunnah Islamic boarding school in Cirebon.

METHODS

This was a quasi-experimental study with a non-equivalent pretest-posttest control group design. The study subjects involved 40 Grade XI students at As-Sunnah Islamic Boarding School of Cirebon, selected from a population of 66 students through a purposive sampling technique based on specific inclusion criteria. The inclusion criteria were Grade XI students who stayed in the dormitory and experienced symptoms of asthenopia." The study subjects were further assigned based on lottery into the intervention group and the control group consisting of 20 students, respectively.

The study was conducted at As-Sunnah Islamic Boarding School, Kalitanjung, Cirebon Regency, West Java, Indonesia for 2 months. This site was chosen because there was no good treatment for the problem of asthenopia. Ethical permission was obtained from KEPK, Faculty of Pharmacy, YPIB University Number 111/KEP/EC/IV/2024. The study subjects signed a 35-point informed consent which contained confidential data that were only used for research purposes.

Data were collected by delivering questionnaires to subjects to assess the Vision Fatigue Index scores (*Eye Health and the Sustainable Development Goals*, 2025). This questionnaire was adopted, modified and tested for validity and reliability and obtained valid and reliable results. Interpretation of assessment results include no asthenopia symptoms (score 0.25), mild asthenopia symptoms (score 0.26 – 0.50), moderate asthenopia symptoms (score 0.51 – 0.75), and severe asthenopia symptoms (score 0.76 – 1.00) (Refayanti et al., 2022). Visual Fatigue Index score assessment was performed before and after eye exercise therapy in the intervention group and after 1 week in the control group, with the aim of assessing any differences between the

intervention and control groups. Eye exercise therapy was performed by the intervention group every day at 06.00 WIB for 7 days with a duration of 10 minutes under the supervision of researchers. The stages of eye exercise therapy were: rotation, glance, squeeze (closed the eyes and applied pressure), blink, glance for 3 seconds, focus training, focus on movement, imagine number 8, eye palming (closed the eyes and covered them with the palm of hand) (Laoli, 2022). The control group was given eye exercises after filling in the VFI post-test questionnaire. Standard procedures for implementing eye exercise therapy and recapitulation of questionnaire results were listed in the research protocol.

The independent variable in this study was eye exercise therapy with a nominal data scale. On the other side, the dependent variable was Asthenopia symptoms with an Interval data scale. Both the intervention group and the control group lived in the dormitory and had the same activity schedule and did not use gadgets, thereby reducing the possibility of confounding factors such as cell phone radiation, differences in sleep times, differences in food consumption or other things that could cause bias.

Data were analyzed using univariate and bivariate analysis. Univariate analysis applied the form of frequency distribution of study variables such as asthenopia symptoms in the treatment group and control group. Furthermore, the bivariate analysis in this study applied the Paired Sample T-Test since the data were normally distributed as proven by the analysis results using the Shapiro-Wilk test with a p value = 0.16 for the intervention group and 0.08 for the control group. Data derived from the questionnaire were further grouped, coded and analyzed using SPSS software.

RESULTS

The study was conducted at As-Sunnah Islamic boarding school dormitory located at Jalan Kalitanjung No. 52B, Karyamulya, Kesambi Sub-District, Cirebon City, West Java Province. There were around 2,300 students at As-Sunnah Islamic boarding school of Cirebon.

The study was conducted by selecting the population and samples based on inclusion criteria and subject consent. The study samples of 40 Grade XI students were selected from 66 subjects based on the Solvin formula with an error rate of 10%. The study subjects were further assigned based on lottery into the intervention group and the control group consisting of 20 students, respectively. These two groups were given the FVI questionnaire sheet (Pre-test) which contained questions regarding identity, learning and reading activities as well as asthenopia symptoms to be answered by all subjects.

After that, the intervention group was given eye exercise therapy for 7 days with a duration of 10 minutes. This eye exercise was performed every morning at 06.00. The control group was not given any intervention during data collection. After 7 days, both groups were given a questionnaire sheet (Post-test) to assess the FVI score. The question items on the pre-test and post-test sheets were the same. None of the initial subjects, namely 40 students, dropped out, all of them participated well in the study implementation. Data derived from the FVI Questionnaire were further scored and interpreted, including the subject's identity. Furthermore, data were analyzed through univariate analysis to determine the frequency distribution, and also through bivariate analysis using the T-Test after previously tested for normality.

Based on Table 1, it was found that in both groups, the symptoms of asthenopia were mostly experienced by the samples at the age of 17 years (19 people or 95%), 9 hours/day of long reading a day (17 students or 85%), 7 hours of sleep a day (20 people or 100%), and do not use glasses (19 students or 95%). On the other hand, reading distance of <30 cm was more common in the treatment group by 15 students (75%), and lying down reading position was also more common in the treatment group by 16 students (80%).

Table 1. Characteristics of Study Subjects

Characteristics of Respondent	Intervention Group		Control Group	
	n	%	n	%
Age				
16 years old	1	5.0	1	5.0
17 years old	19	95.0	19	95.0
Reading duration in a day				
8 hours/day	3	15.0	3	15.0
9 hours/day	17	85.0	17	85.0
Sleep time in a day				
7 hours/day	20	100.0	20	100.0
8 hours/day	0	0.0	0	0.0
Reading distance				
>30 cm	5	25.0	6	25.0
≤30 cm	15	75.0	14	75.0
Position while reading				
Sitting	4	20.0	5	20.0
Lying	16	80.0	15	80.0
The use of glasses				
Yes	1	5.0	1	5.0
No	19	95.0	19	95.0

Source: Primary Data, 2024

Outcome Measures

The results for the pre-test and post-test scores regarding asthenopia symptoms using the VFI questionnaire in the intervention group and control group are presented in table 2.

Table 2 Analysis Results for the Pre-test and Post-test scores regarding Asthenopia Symptoms Using the VFI Questionnaire

VFI Score	Asthenopia Symptoms	Group							
		Intervention				Control			
		Pre-test		Post-test		Pre-test		Post-test	
		n	%	n	%	n	%	n	%
0.25	No Symptoms	-	-	15	75.0	-	-	-	0
0.26 – 0.50	Mild Symptoms	18	90.0	5	25.0	17	85.0	17	85.0
0.51 – 0.75	Moderate Symptoms	2	10.0	0	0.0	3	15.0	3	15.0
0.76 – 1.00	Severe Symptoms	-	-	-	-	-	-	-	-
Total		20	100.0	20	100.0	20	100.0	20	100.0

The average results of asthenopia symptoms, as measured by the VFI questionnaire, before and after eye exercise therapy in the treatment group and the control group, are presented in Table 3.

Table 3 The average FVI score before and after eye exercise therapy

Study Subject	Mean	
	Pre-test	Post-test
Intervention Group	0.49	0.37
Control Group	0.48	0.49

The results of the normality test in both sample groups showed > 0.05 , and the homogeneity test results show an average of 0.53. This means the data is normally distributed and homogenous, so the data is analysed using the Paired Sample T-Test. The t-test results are presented in Table 4.

Table 4. Analysis regarding Pre-Post Comparative Results of Asthenopia Symptoms between the intervention group and the control group

Study Subject	Mean	Deviation Std.	Sig (p value)
Intervention Group	47.72	6.969	0.00
Control Group	37.67	8.340	0.18

DISCUSSION

The study found that eye exercise therapy significantly reduced asthenopia symptoms, as indicated by the decrease in the average Visual Fatigue Index (VFI) score from 0.49 (pre-test) to 0.37 (post-test) in the intervention group, while the control group showed no significant change (0.48 pre-test to 0.49 post-test). This finding confirms that structured eye exercise therapy effectively alleviates eye strain symptoms among students.

Several risk factors contributed to asthenopia symptoms in this study. Long reading duration (≥ 9 hours daily in 85% of students), a reading distance of < 30 cm (75% of students), and reading while lying down (80% of students) were significant contributors. These factors align with previous studies indicating that prolonged near-work activities can cause eye strain, fatigue, and accommodation disorders, leading to asthenopia (Syihabudin, 2023; Martiningsih et al., 2019). Physiologically, prolonged visual tasks increase ciliary muscle tension, leading to lactic acid accumulation and a decrease in muscle pH, which weakens muscle contraction and contributes to fatigue, blurry vision, and discomfort (Pratama et al., 2021). Additionally, reading in a lying position forces eye muscles to work harder to maintain focus, further increasing muscle fatigue (Rozi et al., 2015). This study's findings reinforce previous research demonstrating that inappropriate reading habits significantly impact visual health (Sanjiwani, 2020).

The significant improvement in VFI scores after eye exercise therapy supports existing evidence that eye movement exercises enhance eye muscle elasticity, improve blood circulation, and relieve tension (Maisal et al., 2020). This aligns with findings from Ivada et al. (2022), who reported that college students practicing eye exercises experienced reduced asthenopia symptoms, and Nur Solikah & Hasnah (2022), who found similar benefits among elementary school children.

Furthermore, eye exercises are known to enhance the efficiency of extraocular muscles, thereby improving visual performance (Gupta & Aparna, 2019). Harahap et al. (2023) also demonstrated that eye exercises and acupressure were equally effective in reducing Computer Vision Syndrome (CVS) symptoms among adolescents, further validating the role of non-pharmacological interventions in managing visual fatigue.

The mechanisms behind the effectiveness of eye exercises involve coordinated eye movements, which improve ocular blood circulation and maintain optimal muscle function. This study incorporated nine specific movements, including rotation, glancing, squeezing, blinking, focus training, and eye palming (Maisal et al., 2020), which helped relax the ciliary muscles and improve accommodation function.

While this study demonstrated a significant effect of eye exercise therapy, some limitations and biases should be considered: Sample Size: The study included only 40 students, limiting the generalizability of the findings. Future research should involve larger and more diverse populations to strengthen external validity.

1. Short Duration of Intervention: The 7-day intervention period may not fully capture the long-term effects of eye exercises. Future studies should explore longer-term interventions to assess sustained benefits.
2. Lack of Comparison with Other Interventions: The study compared eye exercise therapy against a control group that received no intervention. Future research should compare different non-pharmacological approaches, such as acupressure therapy or digital eye strain prevention strategies.

The study findings emphasize the importance of integrating eye exercise programs into school health initiatives, particularly for students engaged in prolonged reading or digital screen

exposure. Implementing regular eye exercises in school curricula could help prevent visual strain and improve students' academic performance and quality of life.

The long-term effects of eye exercise therapy on reducing the recurrence of asthenopia, commonly known as eye strain, have gained attention in recent years. Research is increasingly exploring the comparative effectiveness of various interventions, including rest breaks, blue light filters, and nutritional support for eye health. Additionally, broader population studies are being conducted to assess the effectiveness of these interventions across different age groups and educational settings. This comprehensive approach aims to provide insights into how to best support eye health and alleviate symptoms of asthenopia in diverse populations.

CONCLUSIONS

This study provides strong evidence that eye exercise therapy is an effective, non-pharmacological approach to reducing asthenopia symptoms. By improving eye muscle function and reducing visual fatigue, it serves as an accessible and cost-effective strategy for managing eye strain among students.

Author's Contribution Statement: Ivana Eko Rusdiatin: Conceptualization, Methodology, Software. Darmasta Maulana: Data curation, Writing- Original draft preparation. Hasna Nurrohmah: Writing- Reviewing and Editing.

Conflicts of Interest: This study was conducted independently by upholding the principles of research ethics. All aspects of study including planning, implementation, to data analysis, were performed objectively without any influence from external interested parties. Therefore, we declare that there is no conflict of interest in this study. All authors were involved purely on the basis of academic and scientific interests, and did not receive financial support or personal benefits from other parties that might influence the results or conclusions of this study.

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