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The Correlation Between Uncorrected Myopic Refractive Errors and Patterns of Sports Participation Among Students at Senior High School 15 of West Seram Regency

Dodikrisno E Manery[1], Ian R Tofure[2], Ferros Rozik Wakano[3*], Arief Rahman S Kaliky[4], Yushar A Embisa[5], Taufik Zuneldi[6], Abdur Rahman Assagaf[7], Alfaro Muhammad[8]

[1-8]Faculty of Medicine, Universitas Pattimura, Ambon, Indonesia

Abstract

Background: Good visual acuity is important for school-aged children; uncorrected myopia can hinder participation in sports, highlighting the need for vision screening and intervention planning in schools. **Aim:** To examine the association between uncorrected myopic refractive errors and patterns of sports participation among students at SMA 15 West Seram Regency. **Methods:** This study employed a quantitative cross-sectional study design. A total of 76 students with myopic refractive errors were included as respondents. Data were collected directly using a structured questionnaire that assessed the degree of myopia, type of sports activities, and duration of physical activity. Data analysis was performed using the chi-square test with SPSS to determine the association between the degree of uncorrected myopia and sports activity variables. **Results:** The findings showed no statistically significant association between the degree of uncorrected myopic refractive error and the type of sports activities performed ($p > 0.05$), nor with the duration of sports activities ($p > 0.05$). Although students with mild myopia tended to prefer volleyball and engaged in sports activities for approximately two hours, these tendencies did not demonstrate significant statistical relationships. **Conclusion:** Uncorrected myopia was not significantly linked to sports type or duration among students, suggesting non-visual factors play a stronger role in adolescents' participation in school sports activities overall in context.

Keywords: Ankle Injury, Degree of Injury, Family Support, Quality of Life

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***Corresponding author:**
Ferros Rozik Wakano
Faculty of Medicine, Universitas Pattimura, Ambon, Indonesia
Email: roziwakano@gmail.com

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Introduction

Myopia is a refractive condition characterized by elongation of the ocular axial length, causing light rays to focus in front of the retina and resulting in blurred distance vision (Saw et al., 1996; Jonas et al., 2019; Baird et al., 2020). Over the past few decades, myopia has emerged as a major global public health concern due to its rapidly increasing prevalence. Holden et al. (2016) reported a continuous rise in myopia cases worldwide. In 2020, the World Health Organization (WHO) estimated that approximately 2.6 billion people across all age groups were affected by myopia, including 312 million individuals under the age of 19. This number is projected to increase dramatically, with nearly 49.8% of the global population expected to have myopia by 2050, and 9.8% experiencing high myopia (WHO, 2019).

In addition to visual impairment caused directly by refractive errors, myopia is associated with long-term ocular complications. In 2015, approximately 10 million individuals worldwide experienced visual impairment related to age-related macular degeneration (AMD), with 3.3 million cases resulting in blindness. If left unaddressed, the global burden of visual impairment and blindness is projected to rise significantly by 2050 (Supit & Winly, 2021). In Indonesia, the prevalence of myopia among individuals aged over 21 years has reached 48.1%, indicating a substantial national burden (Anugrahsari et al., 2022).

The progression of myopia among school-aged children is influenced by multiple factors, including genetic predisposition and behavioral patterns (Xie et al., 2025). Children with one or two myopic parents are at significantly higher risk of developing myopia compared to those without a family history of refractive errors (Basri, 2014; Ariaty & Hengky, 2019; Al Anwar et al., 2021). Komariah and Wahyu (2014) reported that the prevalence of myopia reaches 32.9% among children with two myopic parents, 18.2% among those with one myopic parent, and less than 8.3% among children whose parents do not have myopia. Environmental factors, such as prolonged near-work activities and exposure to inappropriate lighting conditions, also contribute to myopia development and progression by affecting pupil and lens function (Karouta, 2015; Loilatu et al., 2024; Ciputra et al., 2025).

According to Ilyas (2006), approximately 19 million children under 15 years of age globally experience visual impairment, with 12 million cases attributed to refractive errors. Refractive errors occur when the eye' s optical system fails to focus light accurately onto the retina, leading to reduced visual acuity (Armaijn et al., 2024; Embisa et al., 2025). Uncorrected or inadequately corrected refractive errors remain one of the leading causes of visual impairment, as they prevent individuals from achieving optimal visual function (Budiana & Efendi, 2022; Arwida et al., 2024).

Indonesia ranks among the countries with the highest prevalence of refractive error–related visual disorders, affecting nearly 25% of the population, or approximately 55 million people. The overall prevalence of refractive errors is estimated at 22.1%, with about 10% occurring among school-aged children (Hermawan et al., 2023). This condition represents a

significant public health challenge, particularly due to its impact on children' s learning abilities, physical development, and overall quality of life

Visual development reaches optimal maturity by the age of nine years (Aghnaita, 2017). However, Basri et al. (2020) found that children aged 11 years and older have a 15-fold higher risk of developing myopia. If myopia is not corrected during the school years, progressively blurred vision may interfere with academic performance, cognitive development, and daily functioning (Ali et al., 2021; Liu et al., 2023). Therefore, maintaining good visual acuity is essential for supporting students' academic success and long-term personal development.

Despite increasing awareness of eye health, a considerable number of students with myopia do not receive adequate optical correction (Wolffsohn et al., 2020). Barriers such as limited access to eye care services, lack of awareness regarding the importance of vision correction, and financial constraints remain prevalent (Pratama, 2022; Vallarino et al., 2024). Uncorrected myopic refractive errors may restrict students' ability to engage fully in daily activities, particularly sports participation. Clear distance vision is essential in many sports activities, such as tracking a moving ball, recognizing teammates and opponents, and maintaining spatial awareness. Visual limitations caused by uncorrected myopia can reduce sports performance, lower self-confidence, and ultimately limit students' participation in physical activities. Reduced involvement in sports may negatively affect physical fitness, social interaction, and overall quality of life.

Therefore, this study aims to determine the correlation between uncorrected myopic refractive errors and patterns of sports participation among students at Senior High School 15 of West Seram Regency, providing evidence to support early vision screening and appropriate corrective interventions to enhance students' visual function and active participation in sports activities.

Methods

Research Design

This study employed a cross-sectional study design, in which data on uncorrected myopic refractive errors and patterns of sports participation were collected simultaneously at a single point in time. The cross-sectional approach was chosen to examine the relationship between variables without manipulating the study environment, allowing for an efficient assessment of associations within the study population (Darmawan et al., 2024). The sample size was determined using an analytical formula for unpaired categorical data (Dahlan, 2013). Based on the calculation, a total of 76 students were included in this study. Participants were selected according to predefined inclusion criteria and agreed to participate voluntarily in the research. The data collected in this study were quantitative in nature and expressed numerically to represent the magnitude of the variables examined. Based on their sources, the data were

classified into primary and secondary data (Widodo & Andawaningtyas, 2017). Primary data were obtained directly from respondents using structured instruments, such as questionnaires or interviews. Secondary data were obtained from relevant documents, reports, and published literature related to the research topic.

Research Instrument

The research instrument used in this study was a structured questionnaire adapted from Anggelia et al. (2023). The questionnaire assessed uncorrected myopic refractive errors and patterns of sports participation. Validity testing showed that all questionnaire items met the validity criteria, with calculated correlation values (r_{calculated}) exceeding the critical value (r_{table}). Reliability testing demonstrated acceptable internal consistency, with Cronbach's Alpha values of 0.719 for the myopic refractive error variable and 0.630 for the sports participation variable. Since all values exceeded the minimum threshold of 0.60, the instrument was considered reliable for data collection.

Data Collection Technique

Data collection was conducted directly from respondents using a pre-designed questionnaire. This approach enabled the researchers to obtain accurate and relevant information, as the data were gathered directly from the source.

Data Analysis

Based on the total scores obtained from respondents' answers, the data were categorized and described using frequency distribution tables. According to Riduwan (2003), frequency distribution is a method for organizing data from the smallest to the largest values and grouping them into meaningful categories. To examine the relationship between uncorrected myopic refractive errors and patterns of sports participation, bivariate data analysis was conducted using the Chi-square test. The Chi-square test was selected because the variables analyzed were categorical and aimed to determine the presence of a significant association between the study variables. Statistical analysis was performed using SPSS (Statistical Package for the Social Sciences), with a significance level set at $p < 0.05$.

Results

Respondent Characteristics

The frequency distribution of respondents in this study is presented in Table 1.

Table 1. Frequency distribution of respondents (n=76)

Variabel	n	%
Sex		
Male	27	35,5
Female	49	64,5
Age		
16 years	34	44,7
17 years	41	53,9
18 years	1	1,3
Use of Eyeglasses		
Yes	2	2,6
No	74	97,4

Based on Table 1, the majority of respondents were female, totaling 49 students (64.5%), while 27 respondents (35.5%) were male. Most respondents were 17 years old (41 students; 53.9%), followed by those aged 16 years (34 students; 44.7%), and only one respondent was 18 years old (1.3%). In addition, nearly all respondents did not wear eyeglasses (74 students; 97.4%), while only 2 respondents (2.6%) reported wearing eyeglasses.

Myopic Refractive Errors

The distribution of myopic refractive errors is shown in Table 2.

Table 2. Myopic refractive errors (n= 76)

Variabel	n	%
Degree of Myopia		
Mild myopia	56	73,7
Moderate myopia	16	21,1
Severe myopia	4	5,3
Symptoms Headache		
Yes	27	35,5
No	49	64,5
Eye Fatigue		
Yes	16	21,1
No	60	78,9
Blurred Vision		
Yes	7	9,2
No	69	90,8

As shown in Table 2, most respondents with myopic refractive errors presented with mild myopia (56 students; 73.7%). Moderate myopia was reported by 16 respondents (21.1%), while severe myopia was identified in only 4 respondents (5.3%). Regarding symptoms, 27 respondents (35.5%) reported experiencing headaches, while 49 (64.5%) reported no such complaint. Eye fatigue was experienced by 16 respondents (21.1%), whereas 60 respondents (78.9%) reported no fatigue. Blurred vision was reported by 7 respondents (9.2%), with the majority (69 respondents; 90.8%) not experiencing this symptom.

Sports Activities

Respondents' preferred sports and exercise duration are presented in Table 3.

Table 3. Distribution of sports types and exercise duration (n=76)

Variabel	N	%
Type of Sport		
Futsal	16	21,1
Volleyball	30	39,5
Badminton	5	6,6
Futsal & Badminton	8	10,5
Volleyball & Badminton	15	19,7
Futsal & Volleyball	2	2,6
Exercise Duration		
1 hour	20	26,3
2 hours	35	46,1
3 hours	21	27,6

Based on Table 3, volleyball was the most preferred sport among respondents (30 students; 39.5%). This was followed by a combination of volleyball and badminton (15 respondents; 19.7%) and futsal (16 respondents; 21.1%). Other selected sports included futsal combined with badminton (10.5%), badminton alone (6.6%), and futsal combined with volleyball (2.6%). In terms of exercise duration, most respondents exercised for 2 hours (46.1%), followed by 3 hours (27.6%) and 1 hour (26.3%).

Correlation Between Myopic Refractive Errors and Sports Activities

The results of the analysis examining the correlation between myopic refractive errors, types of sports, and exercise duration are presented in Table 4.

Table 4. Correlation between myopic refractive errors, sports type, and exercise duration

Variabel	Level of myopic refractive abnormality						*P value*
	Mild Myopia		Moderate Myopia		Severe Myopia		
	n	%	N	%	n	%	
Type of Sport							*0,170*
Futsal	12	21,4	4	25,0	0	0	
Volleyball	23	41,1	3	18,8	4	100	
Badminton	2	3,6	3	18,8	0	0	
Futsal & Badminton	7	12,5	1	6,3	0	0	
Volleyball & Badminton	11	19,6	4	25,0	0	0	
Futsal & Volleyball	1	1,8	1	6,3	0	0	
Total	**56**	**100**	**16**	**100**	**4**	**100**	
Exercise Durtion							*0,925*
1 hour	14	25,0	5	31,3	1	25,0	
2 hours	25	44,6	8	50,0	2	50,0	
3 hours	17	30,4	3	18,8	1	25,0	
Total	**56**	**100**	**16**	**100**	**4**	**100**	

The chi-square test results (Table 4) indicate that there was no significant correlation between myopic refractive errors and the type of sport (p = 0.170) or exercise duration (p = 0.925). Although a substantial proportion of respondents with mild myopia preferred volleyball (41.1%) and exercised for 2 hours (44.6%), respondents with moderate and severe myopia were relatively evenly distributed across various sport types and exercise durations, without showing any specific patterns. These findings suggest that neither the type of sport nor the duration of physical activity had a significant influence on the severity of myopic refractive errors among the students in this study.

Discussion

Refractive Error: Myopia

The results of this study indicate that the majority of respondents were classified as having mild myopia, accounting for 73.7% of the total sample. This finding is consistent with previous studies reporting that mild myopia is the most prevalent refractive error among adolescents and students, particularly those engaged in intensive near-work activities such as reading, writing, and prolonged use of digital devices (Holden et al., 2016; Jonas et al., 2019). Mild myopia is often detected during school age and is generally easier to correct, with minimal interference in daily activities when appropriate optical correction is used (Baird et al., 2020).

In contrast, moderate myopia, observed in 21.1% of respondents, may result in more pronounced difficulties in distance vision and typically requires stronger optical correction.

Previous research has shown that moderate myopia in adolescents is associated with an increased risk of progression if not adequately managed, particularly in individuals with prolonged near-work exposure and limited outdoor activities (Saw et al., 2018; Xie et al., 2025). Although this group represented a smaller proportion of respondents, early identification and preventive strategies remain essential to reduce the risk of progression to high myopia.

A smaller proportion of respondents (5.3%) were identified as having severe myopia. While relatively low, this finding is clinically significant, as high myopia is associated with a greater risk of long-term ocular complications such as retinal detachment, myopic maculopathy, and glaucoma (Flitcroft et al., 2019; Ohno-Matsui et al., 2021). This underscores the importance of early screening and continuous monitoring of refractive errors among school-aged populations.

Regarding subjective complaints, headaches were reported by 35.5% of respondents. This finding aligns with studies indicating that uncorrected or inadequately corrected refractive errors may lead to asthenopic symptoms, including headaches, due to excessive accommodative effort and visual strain (Sheedy et al., 2018; Arwida et al., 2024). However, the majority of respondents did not experience headaches, suggesting that symptom manifestation varies depending on individual adaptation and the severity of refractive error.

Eye strain was reported by 21.1% of respondents, which is consistent with previous literature linking visual fatigue to prolonged near-vision tasks, poor lighting conditions, and extended screen time among students (Rosenfield, 2016; Loilatu et al., 2024). Although the prevalence was not high, this symptom may indicate accommodative stress that could contribute to myopia progression if left unaddressed.

Only 9.2% of respondents reported blurred vision, while most did not experience this complaint. This low prevalence may be attributed to the predominance of mild myopia among respondents or the use of appropriate optical correction. Similar findings have been reported in studies showing that students with mild refractive errors often adapt well and may not perceive significant visual disturbances in daily activities (Ali et al., 2021; Liu et al., 2023).

Correlation Between Myopic Refractive Error, Type of Sport, and Duration of Exercise

The chi-square analysis demonstrated no significant correlation between myopic refractive error and type of sport ($p = 0.170$), as well as between myopia severity and exercise duration ($p = 0.925$). These findings suggest that the severity of myopia does not significantly influence students' choice of sport or the length of time they engage in physical exercise. This result is in line with previous studies indicating that sport selection among adolescents is more strongly influenced by external factors such as personal interest, peer influence, school curriculum, and facility availability rather than visual status alone (Eime et al., 2013; Tandon et al., 2019). While visual acuity is important for certain sports, students with mild to moderate myopia can often participate effectively when appropriate correction is used.

Although not statistically significant, respondents with mild myopia were more likely to choose volleyball (41.1%) and engage in approximately two hours of exercise (44.6%). Similar patterns have been reported in earlier studies, where adolescents with mild refractive errors remained actively involved in team sports, particularly those that are popular and easily accessible within the school environment (Rose et al., 2008; Bull et al., 2020). However, these tendencies should not be interpreted as causal relationships, as statistical analysis clearly indicates the absence of a significant association.

Previous research has emphasized that while physical activity—especially outdoor activity—may play a protective role against the development and progression of myopia, the duration of exercise alone is insufficient to explain variations in myopia severity (Wu et al., 2013; Xiong et al., 2017). Environmental exposure to outdoor light, rather than the specific type or duration of sport, appears to be a more critical factor in myopia control. Overall, the findings of this study suggest that uncorrected myopic refractive errors among students at Senior High School 15 of West Seram Regency do not significantly limit sports participation patterns. Nevertheless, ensuring appropriate vision correction remains essential to optimize performance, prevent visual discomfort, and support students' overall well-being and quality of life.

Conclusion

The findings of this study demonstrate that there is no significant correlation between the degree of myopic refractive error and either the type or duration of sport practiced by respondents. Although individuals with mild myopia tended to choose volleyball and exercised for 2 hours, these patterns were not supported by statistically meaningful relationships. Furthermore, the distribution of respondents with moderate and severe myopia across various types and durations of exercise further reinforces that physical activity does not influence the severity of myopia within the study population.

These findings suggest that strategies for preventing and controlling myopia should be directed toward more relevant factors, such as regulating near-vision activities, managing screen time, ensuring adequate lighting conditions, and promoting routine eye examinations. Education on healthy visual behavior is essential to preventing myopia progression, particularly among productive age groups and students who are heavily exposed to prolonged near-vision demands.

Conflicts of Interest

The author declares no conflict of interest related to this work.

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