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ANALYSIS OF FACTORS INFLUENCING THE PROGRESSIVITY OF REFRACTION STATUS ON THE EMPLOYEES OF WIDYA HUSADA UNIVERSITY

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ABSTRACT

Refractive errors are the most common visual disorders throughout the world, one of which is myopia (Yeyen Ariaty et al., 2019). Myopia can be caused by genetic and environmental factors, one of which is close viewing activities such as using gadget, PC screen, or laptop for more than 10 hours without taking a break (Lestari et al., 2020). Using gadgets, PC screens, or laptops is inseparable from our daily life. More than half of the world's population consume digital media as the main choice of communication and media channels at work. Ignoring eye health will affect eye function (Alifina, 2021). Eye diseases are still often experienced by people, so the eyes require good care (Dana, 2020).Objective: This study aims to find out the factors affecting the refractive status progression of Universitas Widya Husada Semarang Staffs. The factors analyzed include age, screen time, eyeglasses use length, and natural history of diseases.Method: This study uses a quantitative research method oriented with inductive logic, while data collection uses questionnaires with Spearman's Rank Test on SPSS (Nursalam, 2019). With saturated sample technique, the total population and the number of samples is 35 respondents, the questionnaire used in primary data collection was carried out. Validity and reliability tests were tested on 30 respondents taken from outside the research location. Results: The study results show a significant correlation of age and screen time, but no significant correlation of eyeglasses use length and natural history of disease to the progression of refractive status. Conclusions: The research data shows that there is a significant relationship between age and length of exposure to the screen, but there is no significant relationship between the use of glasses and a history of disease on the development of refractive status.

Keywords: age; eyeglasses use length screen time; history of disease; progression of refractive status

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INTRODUCTION

Refractive errors are the most common visual disorders throughout the world, one of which is myopia. Myopia can be caused by genetic and environmental factors, including close viewing activities such as using gadgets, PC screens, or laptops for more than 10 hours without taking a break. Nowadays, using gadgets, PC screens, or laptops is inseparable from our daily lives (Rochmayani & Cahyaningsih, 2021). At least more than half of the world's population consumes digital media as the main choice of communication channels and media at work (Hidayani et al., 2020). Ignoring eye health will affect eye function, so good care of the eyes is required. Eye diseases are still often experienced by people, and about 90% of teenagers have visual impairment (Kirana Syafa Ramadhani, Rismayanti, 2022). Furthermore, visual impairment becomes one of the factors causing a decrease in a person's quality of life. Data

retrieved from WHO show that 285 million people worldwide have vision problems, of which 39 million people are blind, while 246 million people have low vision. Globally, visual impairment is caused by 43% of refractive errors, 33% of cataracts, and 2% of glaucoma (Hanny & Waldi, 2023) (Kemenkes RI, 2018). Refractive errors include myopia, hypermetropia, and astigmatism (Prof. dr. H. Sidarta Ilyas, 2018). Among the others, myopia is ranked first as the most common refractive error suffered by the world's population(Suparti, 2020). Myopia is the most common eye disorder globally, and its prevalence rate is quite worrying. The prevalence of myopia has continued to increase in the last 50 years; it is estimated that it has affected 1.6 billion people throughout the world, which is predicted to be 4.8 billion or around 52% of the earth's population in 2050 (Kirana Syafa Ramadhani, Rismayanti, 2022). The Institute of Eye Research estimates that by 2020, the number of myopia sufferers would reach 2.5 billion people (Yu L, Zhi-Kui Li, Jin-Rong Gao, Jian-Rong Liu, 2011).

This study was conducted at Universitas Widya Husada Semarang because, based on preliminary studies, there was an increase in the progression of refractive errors. Computer monitors produce several types of radiation, all of which our five senses cannot perceive. The waves and radiation produced by a monitor are X-rays, ultraviolet rays, microwaves, very low-frequency electromagnetic radiation, and very, very low-frequency electromagnetic radiation (Hidayani et al., 2020). The danger of the monitor screen radiation is that it can damage eye health. Referring to the results of research conducted by the American Optometric Association (AOA), computer radiation can cause eye fatigue and other eye disorders (Institution, 2022).

Many factors can influence the progression of refractive status, including age, eyeglasses use length, screen time, and natural history of diseases. Progression can be defined as the ability to move forward psychologically[(Kamus Besar Bahasa Indonesia, n.d.). Moreover, in the current digital era, where computers and gadgets are highly used, the exposure time to blue light from gadgets and computers is also getting longer, often making the eyes tired, watery, and red (Abdu et al., 2021) (Ari Dina Permana Citra, Machbub Machbub, Oktaviani Cahyaningsih, Hargianti Dini Iswandari, Rinayati Rinayati, 2023). This also affects the increasing number of myopia sufferers, which, if ignored, will affect vision or visual acuity and can even affect the progression of refractive status (Abdu et al., 2021)(Porotu et al., 2015). The aim of this research is to find out what factors influence refractive status so that prevention and treatment can be carried out (Prof. dr. H. Sidarta Ilyas, 2018)

METHOD

This study uses an explanatory research method with a cross-sectional design that explains the relationship between the independent and dependent variables by testing hypotheses formulated using quantitative methods. Furthermore, the saturated sampling technique is employed by taking the population as a sample willing to become research respondents (Notoatmojo, 2018).The primary data used in this study was collected through a structured questionnaire after all respondents gave their consent before being included in the research. The questionnaire has been tested for validity and reliability. Moreover, the univariate analysis is conducted using frequency distribution, while the bivariate analysis uses the Spearman's Rank test.

RESULTS

Table 1.
Frequency distribution of respondents based on age, screen time, eyeglasses use length, and natural history of disease

Variable	Category	f	%
Age	≤35 years old	10	28.6
	> 35 years old	25	71.4
Screen Time	< 2 hours	1	2.9
	2-4 hours	13	37.1
	> 4 hours	2	60
Eyeglasses use length	< 2 years	9	25.7
	2-3 years	3	8.6
	> 3 years	23	65.7
Natural history of disease	No	4	11.4
	Yes	31	86.6
Progression of refractive status	No	4	11.4
	Yes	31	88.6

Table 1 shows that most of the respondents were > 35 years old (71.4%), had screen time mostly > 4 hours (60%), and wearing eyeglasses mostly > 3 years (65.7%). Most respondents had a history of natural disease (86.6%), and most respondents experienced progress in their refractive status(88.6%)

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Table 2.
The correlation between age, screen time, eyeglasses use length, and natural history of disease on the progression of refractive status

Correlation	*correlation coefficient*	*Significant correlation*	Conclusion
Effect of age on the progression of myopia	-0.227	0.002 9	Ha is accepted
Effect of screen time on myopia progression	0.291	0.003 1	Ha is accepted
Effect of eyeglasses use length on myopia progression	0.149	0.393	Ho is accepted
Effect of natural history of diseases on the myopia progression	0.153	0.380	Ho is accepted

DISCUSSION

Characteristics of the Respondents

Table 1 shows that most of the respondents were > 35 years old (71.4%), had screen time mostly > 4 hours (60%), and wearing eyeglasses mostly > 3 years (65.7%). Most respondents did not have a natural history of disease, and some respondents experienced progression in refractive status.A refractive error is a condition where a clear image does not form on the retina due to abnormalities in the eye's optical system, resulting in a blurry image. Refractive errors can be caused by abnormalities in the curvature of the cornea and lens, changes in the

refractive index, and abnormalities in the length of the eyeball axis, and are influenced by several factors, including age, gender, race, and environment (Anita Fitria et al., 2023). Uncorrected refractive errors are a significant cause of visual impairment that can be avoided. This is proven by including refractive errors in the priority "Vision 2020: The Right to Sight – A Global Initiative" launched by the World Health Organization (WHO) and the International Agency for the Prevalent of Blindness. Refractive disorders of Myopia and astigmatism are more common in children; this is caused by refractive conditions in the eye where the surface of the cornea does not have an even curvature, resulting in imperfect light focusing on the retina (Fivi, 2017) (Setyandriana et al., 2018). Meanwhile, hyperopia occurs due to the abnormal shape of the cornea or eye lens, while presbyopia is caused by the muscles around the lens becoming stiff due to aging(Setyandriana et al., 2018) (TA, 2016).

Progression of refractive status can be caused by distance activities related to inadequate eye accommodation power. Inadequate eye accommodation will cause the image to fall behind the retina and trigger growth of the posterior segment, which causes axial elongation of the eye. The image formed will be out of focus or blurry. These changes stimulate the release of retinal neuromodulators, which play a role in controlling the axial elongation of the eye (Pradnyandari et al., 2021). Compliance and eyeglasses use length do not affect the progression of refractive errors; however, wearing eyeglasses is still needed as a control not to worsen the refractive errors, which boosts the progression (Naufal Kingwijati.S, 2024). Progression of refractive status can begin to occur at the age of over 16 years, so wearing eyeglasses as a tool in carrying out work-related activities that require us to be on a monitor screen a lot is necessary even though compliance with the eyeglasses use does not have a very significant effect in preventing the progression of refractive status (Zelika et al., 2018).

Previous studies have shown that multifactorial factors, including genetics and environmental factors, can cause refractive status. Moreover, it has been stated that parents with refractive errors can be caused by genetic factors or health status. Although it can be inherited, refractive errors must not occur at birth. Another factor influencing myopia is the long exposure time required for close work and outdoor activities (Primadiani et al., 2017). Reading and watching television can also affect refractive status, although it will be different for each individual. It does not rule out the possibility that today's lifestyle of using gadgets, such as cell phones, laptops, and computers for too long at a fixed viewing distance, can also affect refractive status (Hidayani et al., 2020). Blue light emitted by electronic devices can cause the eye muscles to work harder (Institution, 2022). Reading will be influenced by position, adequacy of light, and the size of the letters or numbers being read. Meanwhile, when using a computer, it will be related to the emission of images, allowing for different forms of accommodation. The distance required to do these things will influence the refractive status differently (Yasmin, 2019). Using transparent media such as helmets, contact lenses, and glasses of a size that is not suitable for the eyes for too long will also affect the refractive status (Primadiani et al., 2017).

Bivariate Analysis between Age, Screen Time, Eyeglasses Use Length, History of Disease, and Progression of Refractive Status

The correlation between age and myopia progression

A significant correlation result was obtained with $\rho = 0.029 < 0.05$. Therefore, Ha was accepted with a correlation coefficient of -0.227, a low correlation strength, and a negative correlation direction. This means that the study results indicated a correlation between age and the progression of refractive status with a low correlation strength and a negative direction, i.e., an increase. Aging can affect progressive status but is not too risky due to low

correlation. Age is calculated from the time of birth until the birthday. The older one gets, the more mature a person's level of maturity and strength will be in thinking and working. Society believes that someone more mature is trusted than someone less mature. This will be a result of experience and mental maturity. Productive age is the age when someone is still able to work and produce something. The population of productive age ranges from 15-64 years. In a productive age, a lot of activities and work are done at home, especially during the pandemic. Myopia is progressive during childhood and tends to be stable when they reach the age of 20 or late adolescence (Yuswantoro et al., 2021). The National Research Council Committee on Vision Working Group on Myopia Prevalence and Progression concluded that refractive status could begin to develop or progress over the age of 16; however, the degree is not severe and in a small population (Primadiani et al., 2017).

The correlation between screen time and the progression of refractive status

A significant correlation was obtained with $\rho = 0.031 < 0.05$. Therefore, Ha was accepted with a correlation coefficient of 0.291, a low correlation strength, and a negative correlation direction. This means that the study results showed a correlation between screen time and the progression of the refractive status with low correlation strength and a positive direction, i.e., an increase. Screen time can influence the progression of the refractive status even though the power is very low. Research at the University of South Carolina categorizes computer use into three categories, namely light (less than 2 hours), moderate (2-4 hours), and heavy (more than 4 hours) per day. This causes serious eye complaints, such as dry eyes and blurred vision. Exposure to monitored light and the influence of the eye's accommodation power causes myopia to progress (Prof. dr. Soehardjo SU, 2023). It can be concluded that this theory is in accordance with the existing research results, stating that there is a strong correlation between the duration of Monitor use and myopia progression. Prolonged use of computers, laptops, and cell phones causes the ciliary muscles to influence the eye's lens to become convex. Thus, the eyes become insensitive to distant objects because reading text in small print on the monitor causes eye strain (Eksa, D. R., Pratiwi, P., & Marni, 2019).

The correlation between eyeglasses use length and the progression of refractive status

A significant correlation was obtained with $\rho = 0.393 > 0.05$. Therefore, Ho was accepted with a correlation coefficient of 0.149, a very low correlation strength, and a positive correlation direction. This means that the study results indicated no correlation between the eyeglasses use length and the progression of refractive status with a very low correlation strength and a positive correlation direction. The eyeglasses use length does not affect the progressive status but can be risky even if the strength is very low. A change in the size of eyeglasses causes discomfort in the eyes, making the eyes work harder than before. Eyeglasses are external optical aids to provide clearer vision to people with blurred vision caused by impaired eye focus (Muzadzi, 2023). These results are not in accordance with existing research, namely that the length of use of eyeglasses has a significant influence on the progression of myopia. These results are supported by research by Nurwinda, Sri Rejeki, and Mulyaningrum, stating that there is no significant difference in myopia progression between subjects who wear glasses for less than 2 years, 2-3 years, and 3 years. Eyesight will not be affected by how long you wear glasses. This is because glasses only function to help correct refractive errors (Christiningrum, 2020).

The correlation between the natural history of diseases and myopia progression

A significant correlation result was obtained with $\rho = 0.380 > 0.05$. Therefore, Ho was accepted with a correlation coefficient of 0.153, a very low correlation strength, and a negative direction. This means that the study results indicated no correlation between the

natural history of the disease and the progression of the refractive status. As a result, someone who has natural history of diseases is not at risk of very low strength in experiencing progression of refractive status. Degenerative diseases such as uncontrolled diabetes mellitus, certain types of cataracts, hypertension, and certain medications can affect refraction and lenses, which can cause myopia. A study was conducted on 15 families in Hong Kong whose natural history of the disease may be a risk factor for suffering from progressive myopia in the last two generations. This result is in accordance with existing research, namely, someone who has a natural history of the disease has a low risk of experiencing myopia progression (Damawiyah & Noventi, 2019).

CONCLUSION

There was a significant correlation between age and screen time on the progression of refractive status, while there was no significant correlation between eyeglasses use length and natural history of disease. Therefore, knowledge about refractive status and risk factors for myopia needs to be elevated. Moreover, respondents who felt their vision was blurry can immediately have their eyes checked by an optometrist.When they are diagnosed as minus, they must immediately use glasses to prevent the size of the minus from increasing.Future researchers are expected to look for a larger sample to obtain more information and knowledge about myopia. Researchers are also expected to look for research on different variables that cause myopia, thereby expanding the existing literature.

REFERENCES

Abdu, S., Saranga', J. L., Sulu, V., & Wahyuni, R. (2021). Dampak Penggunaan Gadget Terhadap Penurunan Ketajaman Penglihatan. Jurnal Keperawatan Florence Nightingale, 4(1), 24–30. https://doi.org/10.52774/jkfn.v4i1.59

Alifina, N. (2021). Hubungan Aktivitas Luar Ruangan dengan Miopia Mahasiswa Kedokteran Angkatan 2019 Universitas Andalas. JIKESI (Jurnal Ilmu Kesehatan), 2 no 1.

Anita Fitria, D., Lassie, N., & Birman, Y. (2023). Profil Kelainan Refraksi Pada Anak Usia Sekolah Dasar di Rskm Padang Eye Center Tahun 2022. Scientific Journal, 2(5), 219–229. https://doi.org/10.56260/sciena.v2i5.115

Ari Dina Permana Citra, Machbub Machbub, Oktaviani Cahyaningsih, Hargianti Dini Iswandari, Rinayati Rinayati, P. P. (2023). Effect of gadget use on student eyes health during the Covid-19 pandemic. AIP Conference Proceedings, 1.

Christiningrum, M. (2020). Hubungan keteraturan pemakaian kacamata dengan progresivitas kelainan refraksi pada siswa Sekolah Menengah Pertama. Trisakti.

Damawiyah, S., & Noventi, I. (2019). Hubungan Dukungan Keluarga Dalam Pemeliharaan Kesehatan Mata Dengan Ketajaman Penglihatan Pada Anak Usia Sekolah Dasar Di Rw 10 Desa Kramat Jegu Taman Sidoarjo. Journal of Health Sciences, 12(02), 82–89. https://doi.org/10.33086/jhs.v12i02.576

Dana, M. M. (2020). Gangguan Penglihatan Akibat Kelainan Refraksi yang Tidak Dikoreksi. Jurnal Ilmiah Kesehatan Sandi Husada, 12(2), 988–995. https://doi.org/10.35816/jiskh.v12i2.451

Eksa, D. R., Pratiwi, P., & Marni, M. (2019). Pengaruh Aktivitas Melihat Jarak Dekat Terhadap Angka Kejadian Miopia Pada Mahasiswa Fakultas Kedokteran Universitas Malahayati. Jurnal Ilmu Kedokteran Dan Kesehatan, 6(2), 81–92.

Fivi, S. (2017). Hubungan Faktor Keturunan Dan Gaya Hidup Dengan Kejadian Miopia Pada Anak Usia Sekolah Di Balai Kesehatan Indera Masyarakat Sumatera Barat Tahun 2017.

Hanny, R., & Waldi, N. (2023). Pelayanan kesehatan anak di rumah sakit. WHO Indonesia, 1(pelayanan masyarakat), 434.

Hidayani, N. P., Tat, F., & Djogo, H. M. A. (2020). Hubungan Antara Lama Penggunaan , Jarak Pandang Dan Posisi Tubuh Saat Menggunakan Gagdet Dengan Ketajaman Penglihatan. CHM-K Applied Scientifics Journal, 3(1), 28.

Institution. (2022). Radiasi Layar Monitor Saat Menggunakan Komputer Maupun Laptop. Universitas Stekom (Sains Dan Teknologi). https://teknik-informatika-s1.stekom.ac.id/informasi/baca/Radiasi-Layar-Monitor-Saat-Menggunakan-Komputer-Maupun-Laptop/7c3e5ee4a039488490773796641c8f20b71c62c7

Kamus Besar Bahasa Indonesia. (n.d.).

Kemenkes RI. (2018). Buku Saku Bagi Calon Pengantin. International Migration Review, 47(2), 330-373. http://onlinelibrary.wiley.com/doi/10.1111/imre.12028/abstract

Kirana Syafa Ramadhani, Rismayanti, & I. D. (2022). Faktor Yang Berhubungan Dengan Kejadian Miopia Pada Siswa SMA Negeri 17 Makassar. Hasanuddin Journal of Public Health, 3(2), 125–134.

Lestari, T. T., Anggunan, A., Triwahyuni, T., & Syuhada, R. (2020). Studi Faktor Risiko Kelainan Miopia Di Rumah Sakit Pertamina Bintang Amin. Jurnal Ilmiah Kesehatan Sandi Husada, 11(1), 305–312. https://doi.org/10.35816/jiskh.v11i1.275

Muzadzi, T. (2023). Cara Kerja Kaca Mata dengan Kelainan Mata. 66(1997), 37–39.

Naufal Kingwijati.S, G. D. . (2024). Correlation Between Compliance Of Spectacle Wear And Myopia Progressivity Rate In Medical Students Of Diponegoro University. Ophthalmologica Indonesiana, 49(S1):124-129. https://doi.org/10.35749/hzcq9x75

Notoatmojo, S. (2018). Metodologi Penelitian Kesehatan. PT Rineka Cipta.

Nursalam. (2019). Konsep & Penerapan Metodologi Penelitian Ilmu Keperawatan. Rineka cipta.

Porotu, L. I., Joseph, W. B. S., & Sondakh, R. C. (2015). Faktor-faktor yang Berhubungan dengan Ketajaman Penglihatan pada Pelajar Sekolah Dasar Katolik Santa Theresia 02 Kota Manado. E-Journal Universitas Sam Ratulangi, 4(1), 31–39. http://ejournal.unsrat.ac.id/index.php/kesmas/article/download/7237/6739

Pradnyandari, N. W. J., Juliari, I. G. A. M., Kusumadjaja, M. A., & Siska, S. (2021). Hubungan Faktor Risiko Dengan Angka Kejadian Kelainan Refraksi Mahasiswa Tahun Pertama Fakultas Kedokteran Universitas Udayana. E-Jurnal Medika Udayana, 10(5), 14. https://doi.org/10.24843/mu.2021.v10.i5.p03

Primadiani, I. S., Rahmi, F. L., & Miopia, P. (2017). Faktor-Faktor Yang Mempengaruhi Progresivitas Miopia Pada Mahasiswa Kedokteran. Diponegoro Medical Journal (Jurnal Kedokteran Diponegoro), 6(4), 1505–1517.

Prof. dr. H. Sidarta Ilyas. (2018). Ilmu Penyakit Mata (5th ed.). Badan Penerbit Fakultas Kedokteran Universitas Indonesia.

Prof. dr. Soehardjo SU, S. . (K). (2023). Buku Ilmu Kesehatan Mata Title (4th Ed.). Fk Ugm.

Rochmayani, D. S., & Cahyaningsih, O. (2021). Risk Factors for the Incidence of Computer Vision Syndrome (CVS) in Lecturers During the Online Learning Period. Journal of Health Education, 6(2), 65–72. https://doi.org/10.15294/jhe.v6i2.47513

Setyandriana, Y., Shani Meida, N., Ikliludin, A., & Nindya Ayuputri, A. (2018). Hubungan Faktor Genetik dan Gaya Hidup dengan Astigmatisma pada Anak. Mutiara Medika: Jurnal Kedokteran Dan Kesehatan, 18(2), 55–60. https://doi.org/10.18196/mm.180216

Suparti, S. (2020). Analisa Faktor Risiko Kebiasaan Yang Berpengaruh Terhadap Kejadian Myopia Pada Siswa SMA. Widya Husada Nursing Conference, 25–32.

TA, E. (2016). Prevalensi dan Penyebab Kelainan Refraksi pada Anak Usia Sekolah Dasar Muhammadiyah 16 Palembang. Universitas Muhammadiyah Palembang.

Yasmin, R. (2019). Analisis Peningkatan Derajat Miopia Pada Pola Hidup Mahasiswa FK UNS. Universitas Sebelas Maret, Surakarta, Indonesia.

Yeyen Ariaty, Henni Kumaladewi Hengky, & Afrianty. (2019). Faktor - Faktor Yang Mempengaruhi Terjadinya Miopia Pada Siswa/I Sd Katolik Kota Parepare. Jurnal Ilmiah Manusia Dan Kesehatan, 2(3), 377–387. https://doi.org/10.31850/makes.v2i3.182

Yu L, Zhi-Kui Li, Jin-Rong Gao, Jian-Rong Liu, C.-T. X. (2011). Epidemiology, genetics and treatments for myopia. International Journal of Ophthalmology, 4, (6):658–69.

Yuswantoro, E., Christiani, M., & Mandasari, Y. P. (2021). Kajian Miopia Pada Anak Usia Sekolah. Journal of Applied Nursing (Jurnal Keperawatan Terapan), 7(1), 1. https://doi.org/10.31290/jkt.v7i1.2131

Zelika, R. P., Wildan, A., & Prihatningtias, R. (2018). Faktor-Faktor Yang Berhubungan Dengan Kepatuhan Pemakaian Kacamata Pada Anak Sekolah. Diponegoro Medical Journal (Jurnal Kedokteran Diponegoro), 7(2), 1063–1071.