Article

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Analysis on Screen Time and Screening of Children's Visual Acuity in the Pandemic Era

Abstract

One of the causes of eye vision problems in children is the use of digital screen devices during the covid-19 pandemic. This is due to an increase in accommodation and convergence in the eyes when doing activities through digital screen devices at close range. The purpose of this study was to determine the relationship between screen time duration and visual acuity in children aged 9-12 years in the Kalongan and Sidokerto Malang areas during the Pandemic era. This research is a descriptive observational quantitative research with cross sectional research design. The research sample was 62 children with a saturated sampling method or a number of population members. The research was conducted in the community of school-age children in the Kalongan and Sidokerto Malang areas. The data used in this study were primary data giving questionnaires to children through parents and checking children's visual acuity. The analysis method used in this research is a univariate and bivariate analysis using the chi-square test. Based on the results of statistical tests, the P value is less than 0.05, which means that there is a relationship between screen time duration and decreased vision in the right and left eyes.

Keywords: children, Screen time, visual acuity

Analisis Screen Time dan Skrinning Ketajaman Penglihatan Anak Di Era Pandemic

Abstrak

Salah satu penyebab gangguan penglihatan mata pada anak adalah penggunaan perangkat layar digital pada masa pandemi covid-19. Hal ini diakibatkan adanya peningkatan akomodasi dan konvergensi pada mata saat melakukan aktivitas melalui perangkat layar digital dengan jarak yang dekat. Tujuan dari penelitian ini adalah untuk mengetahui hubungan durasi screen time dengan ketajaman penglihatan pada anak usia 9-12 tahun di wilayah Kalongan dan Sidokerto Malang di era Pandemi. Penelitian ini merupakan penelitian kuantitatif observasional deskriptif dengan desain penelitian cross sectional. Sampel penelitian adalah 62 anak dengan metode pengambilan sampel jenuh atau sejumlah anggota populasi. Penelitian dilakukan pada komunitas anak usia sekolah di wilayah Kalongan dan Sidokerto Malang. Data yang digunakan dalam penelitian ini adalah data primer dengan pemberian quesioner kepada anak melalui orang tua dan pemeriksaan ketajaman penglihatan anak. Metode analisis yang digunakan dalam penelitian ini adalah analisis univariat dan bivariat dengan menggunakan uji chi-square. Berdasarkan hasil uji statistic, nilai P value kurang dari 0,05 yang berarti terdapat hubungan antara durasi screen time dengan penurunan penglihatan pada mata kanan dan kiri.

Kata Kunci: *Anak Ketajaman Penglihatan, Screen time*

INTRODUCTION

The Covid-19 pandemic has caused significant changes, one of which is in the field of education. UNESCO (2020) noted that as many as 673,114,704 students have been affected by education (Lase et al., 2022). The shift from face-to-face learning to online learning has led to an increase in children's layer-based activities or *screen time* at home. Screen time is considered as the time spent by children

on screen-based activities such as gadgets/smartphones, laptops, computers, televisions, and others, either actively (e.g., online learning, communication, playing games), or passively (e.g., watching television) (Toombs et al., 2022).

A survey of parents in Canada conducted during the Covid-19 pandemic in 2020 showed that the time children spent watching screen content and playing video games increased significantly from 2.6 hours/day (before the pandemic) to 5.9 hours/day (during the pandemic). (Cheung et al., 2022). In addition, a study conducted in the United States also reported that the time children spent both actively and passively using digital screen devices (outside of online learning activities) has increased during the Covid-19 pandemic, ranging from 0.75 hours to 6.5 hours/day (Toombs et al., 2022). (Toombs et al., 2022).. Based on guidelines from the American Academy of Pediatrics (AAP), the Canadian Association of Optometrists (CAO), and the Australian National Physical Activity and Sedentary Guidelines, the safe screen-based activity time limit for school-aged children (5-18 years) is a maximum of 2 hours/day. (American Academy of Pediatrics, 2016) (Australian Parents Council, 2016)(Canadian Association of Optometrists, 2017).

Increased screen-based activity time in children that exceeds normal limits has been associated with various health problems, one of which is impaired visual acuity in children's eyes. (Wong et al., 2020) (Liu et al., 2021) (Aslan & Sahinoglu-Keskek, 2022)(Munsamy, Moodley, et al., 2022). Visual impairment in children's eyes due to the use of digital screen devices during the Covid-19 pandemic digital screen devices used (Aslan & Sahinoglu-Keskek, 2022)(Munsamy, Moodley, et al., 2022). One of these pediatric visual acuity disorders is myopia. The origin and development of myopia have been studied for many years. According to previous studies, myopia is now considered to be a complex condition influenced by both genetics and environment (Mohan et al., 1985). The prevalence of myopia is known to be higher in school-age children and educated individuals, and lower in illiterate populations (Taylor, 1981) (Hepsen et al., 2001). According to WHO, visual impairment is classified into several categories, namely mild visual impairment with vision ≥ 6/18, moderate visual impairment with vision less than 6/18 - 6/60, severe visual impairment less than 3/60 - 3/6, blindness with vision less than 3/60 to no light perception, and unqualified visual impairment. The cause of this decrease in vision is due to an increase in accommodation and convergence in the eye when doing activities with digital screen devices at a close distance. As a result of the accommodation, the refractive power of the lens increases so that points that are closer to the eye are refracted to fall on the retina (Hepsen et al., 2015). (Hepsen et al., 2001)..

Based on the explanation above, it can be seen that the increase in time spent on activities using digital screen devices (screen based activity or screen time) during the pandemic can cause visual impairment in the eyes for a long time and this can have a worse impact if not immediately addressed. Therefore, the purpose of this study is to determine the relationship between screen time duration and decreased vision in children aged 9-12 years in Kalongan and Sidokerto Sub-districts of Malang during the pandemic era.

MATERIALS AND METHODS

This type of research is descriptive observational quantitative research with a cross sectional research design conducted from November 2022 to January 2023. The research location was carried out in Kalongan and Sidokerto Districts, Malang Regency. The research sample was 62 children with a saturated sampling method or as many as population members. Primary data collection was done with a questionnaire instrument and visual acuity examination through the Snellen chart. Researchers gave questionnaires related to the duration of screen time to children aged 9-12 years in the Kalongan and Sidokerto areas through their parents. After being given a questionnaire, the child will undergo a visual acuity examination using the Snellen chart. Researchers then provide education about eye health.

The management of the data obtained includes screen-based activity questionnaire data and visual examination data that have been classified into mild, moderate, and severe visual acuity decline. Then processed with Excel and SPSS. The univariate analysis resulted in profiles and percentages while

Bivariate analysis was used to see the relationship between screen-based activities and decreased vision in school-age children using the Chi-Square test. This research has passed the Health Research Ethics Committee Test of the Faculty of Medicine, University of Muhammadiyah Malang with Ethics No. E.5.a/046/KEPK-UMM/III/2023.

RESULT

Table 1. Distribution of respondents based on gender

Gender	Frequency (n)	Percentage (%)
Men	31	51,7
Women	29	48,3
Total	60	100

The results showed that there were 31 (51.7%) male respondents, 3.4% more than female gender, 29 (48.3%) respondents. Most of the media used by respondents in the form of cellphones by 95%.

Table 2. Distribution of respondents based on criteria for playing online games

Criteria for playing *online games*	Frequency (n)	Percentage (%)
Play *online games*	43	71.7
Don't play *online games*	17	28,3
Total	60	100

Based on the questionnaire results, all respondents were asked questions about online gaming. It was found that 43 (71.7%) respondents stated that they had played online games and only 17 (28.3%) respondents did not play online games.

Table 3. Distribution of respondents based on visual inspection results

Vision Criteria	OD		OS	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Normal	43	71.7	45	75.0
Mild	6	10.0	5	8,4
Medium	9	15.0	8	13,3
Weight	2	3,3	2	3,3
Total	60	100	60	100

The vision examination found that 43 (71.7%) respondents had normal right eye vision. Some respondents experienced a decrease in right eye vision which varied, namely a mild decrease in right eye vision of 10.0%, moderate 15.0%, and severe 3.3%. In the left eye vision examination, 75.0% of the respondents had normal left eye vision. While students who experienced a mild decrease in left eye vision amounted to 8.4%, as many as 13.3% experienced a decrease in moderate vision, and 3.3% experienced a decrease in severe vision.

Table 4. Distribution of respondents based on left eye vision examination results

Screen-Based Activity Duration	Penglihatan Mata Kiri				Left Eye Vision
	Normal		Reduced Eye Vision		
	N	%	N	%	
<2 hours	27	60,0%	2	13,3%	<0,05
>2 hours	18	40,0%	13	86,7%	
Total	45	100,0%	15	100,0%	

Visual examination results showed that 2 (13.3%) children had decreased left eye vision who had screen-based activity duration < 2 hours while 13 (86.7%) children with screen-based activity duration > 2 hours had decreased left eye vision. Based on statistical tests, there was a significant relationship between screen-based activity duration and decreased vision in the left eye.

Table 5. Distribution of respondents based on the results of the right eye visus examination

Screen-Based Activity Duration	Right Eye Vision				*P-Value*
	Normal		Reduced Eye Vision		
	N	%	N	%	
<2 jam	30	69,8%	3	7,7%	<0,05
>2 jam	13	30,2%	14	92,3%%	
Total	43	100%	17	100%	

Examination of right eye vision showed that there were 3 (7.7%) children who had decreased right eye vision with screen-based activity duration < 2 hours, but 14 (92.3%) children with screen-based activity duration > 2 hours had decreased right eye vision. Based on the statistical tests conducted, there was a correlation between the duration of screen-based activities and decreased vision in the right eye.

DISCUSSION

The results showed that the respondents were predominantly male (51.7%). This is supported by population data for Malang Regency in 2019 which states that the total population aged 5-14 years in this Regency is 418,336 people, with a male population of 213,227 people and a female population of 205,109 people. (Central Bureau of Statistics, 2020). This data shows that the male population outnumbers the female population. Due to the larger male population, the behavior or activity of using digital screen devices (screen-based activity) is also expected to occur more in male groups. Various studies have reported that screen-based activities with high frequency and duration are more prevalent in boys (Mullan, 2018) (Mullan & Hofferth, 2022) (Braig et al., 2018) (Thomas et al., 2019) (Tripathi & SK, 2020) (Tripathi & SK, 2020) (Soltero et al., 2021) (Dahlgren et al., 2021).

Based on the results of this study, most of the media used by respondents are cellphones at 95%. Research from Wulandari (2016) shows that active smartphone users in Indonesia reach 47 million people, of which 79.5% are children and adolescents. (Wulandari, 2016). This research is also supported by research from Zaini and Soenarto (2019), where 90% of parents stated that the types of gadgets that are often used by children aged 4-6 years are smartphones and tablets. (Zaini, 2019).

In addition, 71.7% of respondents stated that they had played online games, while 28.3% of respondents did not play online games. This can be a risk factor for increasing the duration of screen-based activities. In line with Susanti's research in 2018, based on NPD Group data (2014) shows that children aged 2-12 years spend an average of ≥ 2 hours playing games. (Susanti et al., 2018) . This is reinforced by the results of research from Harahap in 2021, it was found that elementary school

students who played low-intensity online games were 20%, themoderate intensity was 40% and high intensity 40%. (Harahap & Ramadan, 2021).

Based on the results of the visual impairment examination, it was found that most respondents had a normal right-eye vision, namely 43 (71.7%) respondents. Some respondents experienced a decrease in right eye vision which varied, namely a mild decrease in right eye vision of 10.0%, 15.0%, and 3.3%. In the left eye vision examination, 75.0% of the respondents had normal left eye vision. Meanwhile, students who experienced a mild decrease in left eye vision amounted to 8.4%, as many as 13.3% experienced a moderate decrease in vision, and as many as 3.3% experienced a severe decrease in vision.

Based on the results of the analysis, 2 (13.3%) children with decreased left eye vision had screen-based activity duration of fewer than 2 hours while 13 (86.7%) children with screen-based activity duration of more than 2 hours had decreased left eye vision. Based on statistical tests, a significant relationship was found between the duration of screen-based activities and decreased vision in the left eye.

Examination of right eye vision showed that 3 (7.7%) children with screen-based activity duration of fewer than 2 hours had decreased right eye vision, but 14 (92.3%) children with screen-based activity duration of more than 2 hours had decreased right eye vision. Based on the statistical tests conducted, a correlation was found between the duration of screen-based activities and decreased vision in the right eye.

Purnomo et al.'s research in 2020 with the title "Early Detection of Decreased Visual Acuity in Elementary School-Age Children", found that of the 85 children whose vision was examined using the Snellen chart, 3.5% of children had severe visual impairment, 3.5% had moderate visual impairment. 16.5% had mild vision impairment and 75.3% of children had normal vision. Another study from Gama in 2019 also stated that 88.9% of children had normal vision while children with severe, moderate and mild visual impairment were 0.7%, 5.6% and 2.1% respectively.

As children have come to rely on technology for social interaction and academic growth, the increase in screen time in children has become a public health concern. This has received a lot of attention from the eye health community in recent literature, calling it "digital eye strain". Activity with digital devices and lack of outdoor playtime, contribute to the current occurrence of myopia (Munsamy, Chetty, et al., 2022). Based on previous research, decreased vision in children can interfere with their activities due to screen-based activities (Rudhiati et al., 2020). (Rudhiati et al., 2015). Supervision of children's activities needs to be carried out by parents so as not to worsen the child's health condition which can have an impact on the continuity of their activities. In children who have experienced eye health problems, it is important for parents to immediately make decisions regarding health services for their children. (Supriyanto et al., 2023).

CONCLUSION

There is a correlation between screen-based activity duration and decreased vision of the right and left eyes (p-value <0.05). Suggestions that can be given by researchers are that parents and students should be given counseling on how to maintain eye health and conduct home visits to children with severe vision loss.

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