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Analysis of Screen Based Activity on Digital Eye Strain in School-Age Children in Peniwen Village, Malang, East Java

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ABSTRACT

Introduction: The use of digital devices has increased across all age groups and professional fields, making them inseparable from everyday life. This increase in the duration of screen-based activities causes various symptoms of eye health problems. This study aimed to determine the prediction of the relationship and influence between Screen-Based Activity (SBA) and the incidence of Digital Eye Syndrome (DES) in children aged 9-12 years in Peniwen Village, Malang.

Material and Methods: This study used a cross-sectional analytical observational design. There were 62 respondents in the research samples, or the same number as the total population. The analysis technique used in this study is the Partial Leas Square (PLS) modeling technique with testing using software such as SmartPLS (v3.2.9).

Results: Based on the results of the analysis, obtained t-count (23.821) is greater than the t-table (1.96), meaning that there is a relationship and influence between SBA variables on DES. The correlation coefficient of SBA to DES is positive 0.818 which means the higher the Screen Based Activity, the higher the risk of Digital Eye Strain. The use of handphone (X2) is an indicator of SBA with the highest correlation strength of 88.1%.

Conclusion: There is an association between the duration of Screen Based Activity and the incidence of Digital Eye Strain in children. The higher the Screen Based Activity, the higher the risk of Digital Eye Strain. In addition, the use of handphones has the highest correlation in influencing the occurrence of Digital Eye Strain in school-age children in Peniwen Village.

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INTRODUCTION

In recent years, the use of digital devices has increased across all age groups and professional fields as an integral part of everyday life [1,2]. In children, screen time is considered as the duration of time spent in activities with exposure to digital screens (screen-based activities) such as gadgets/smartphones, laptops, computers, or televisions, either actively (e.g. online learning, communication, games) or passively (reading). The definition of screen-based activity is any activity that children do relate to the use of screen-based media (television, computers, video games, and gadgets) [3].

Previous research states that the time children spend watching screen content and playing video games increased significantly from 2.6 hours/day in 2018 to 5.9 hours/day after 2020 [4]. In addition, a study conducted in the United States also reported that children's time spent both actively and passively using digital screen devices (outside of online learning activities) increased in 2021, ranging from 0.75 hours to 6.5 hours/day [5]. 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 [5,6].

This increased screen-based activity time linearly contributes to the appearance of various symptoms of eye health problems [7–10]. High digital usage

universally results in digital eye strain [1]. Digital eye strain (DES) is a set of symptoms of eye health problems resulting from prolonged use of digital devices such as televisions, computers, tablets, e-readers, or cell phones [7]. Blue light radiation from digital devices can cause damage to the retina (phototoxicity). Blue light is the emission from the screens of digital devices, such as televisions, laptops, handphones, tablets, and other gadgets. The human eye is generally sensitive to 1 part of the light wave spectrum, namely visible light [10]. Previous studies have shown that prolonged exposure to blue light from digital devices can cause macular degeneration, which is an important part of the eye's retina that, if damaged, can lead to visual impairment [11].

Based on the explanation above, it is known that the longer the duration of the activity of using digital screen devices (screen-based activity), the higher the risk of visual impairment in children. Prolonged exposure to blue light radiation in the eyes will be fatal. Therefore, the purpose of this study is to determine the prediction of the relationship and influence of Screen Based Activity (SBA) to the incidence of Digital Eye Syndrome (DES), which is an early symptom of eye health problems in children aged 9-12 years, in Peniwen Village, Malang.

MATERIAL AND METHODS

This study was an analytic observational study with a cross-sectional design conducted from November 2022 to January 2023. The research location is Peniwen Village, Malang Regency. The population of this study was school-age children aged 9-12 years. The sample of this study was all members of the population or saturated samples, namely 62 respondents.

Statistical analysis using Partial Least Square (PLS) modelling with testing using software such as SmartPLS (v3.2.9). SEM PLS aims to predict the relationship between latent variables SBA and DES. Before testing the hypothesis that SBA affects DES, two evaluation stages were carried out, the measurement model (outer model) and the structural model (inner model). The measurement model is conducted to verify that the indicators of watching television, using computers and using cell phones have a significant correlation with Screen-Based Activity as the latent variable. And testing the significance of 9 (nine) symptoms as indicators of the Digital Eye Strain variable.

The requirement that must be met so that an indicator can be analyzed further is if the loading factor (λ) value of the indicator is greater than 0.5. The indicator is considered to be uncorrelated with the latent variable if it is less than 0.5, therefore it cannot be included in the second stage of analysis, namely the structural model [12]. The following are the results of the loading value (λ) obtained.

Ethics

Ethical clearance has been obtained through the Health Research Ethics Committee Test of the Faculty of Medicine, Muhammadiyah University of Malang with Ethics No. E.5.a/046/KEPK-UMM/III/2023.

RESULTS

In Table 1, the number of male and female respondents was equal, namely 31 respondents each. The age of respondents was dominated by 11 years old, as many as 20 respondents (32.3%) and the least was 9 years old, as many as 12 respondents (19.4%). Child respondents who used glasses were 54.8% and most (59.7%) have had an eye examination in the past year.

Table 1. Distribution of Children based on Characteristics

Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	31	50,0
Female	31	50,0
Age		
9 Years	12	19,4
10 Years	17	27,4
11 Years	20	32,3
12 Years	13	21,0
Using Glasses		
Yes	34	54,8
No	28	45,2
Eye Examination in the Last Year		
Yes	37	59,7
No	25	40,3

Based on Table 2, respondents spent more time using *handphones* than watching television or using computers. 51.6% of the respondents used *handphone* for 2-4 hours per day, and 11.3% for >4 hours. Most respondents watched television for <2 hours/day and used computers for 2-4 hours/day.

According to Table 3, 75.8% of respondents reported having headaches frequently, and 77.4% reported that they were tired in the neck. Compared to other symptoms, these were occurred the most frequently. Additionally, 56.5% of respondents reported they occasionally experienced watery eyes. Some of the other symptoms included dry eyes, eye strain, burning eyes, red eyes, blurred vision, a feeling of foreign objects in the eyes, and double vision.

Based on Fig. 1, it shows that all indicators that measure each latent variable have a loading factor value above 0.5. The loading factor value of each indicator shows that more than 68.9% has a correlation strength with the latent variable (Screen Based Activity). The

Table 2. Frequency Distribution of Screen-Based Activity Duration

SBA Duration	Frequency (n)	Percentage (%)
Watching Television (X1)		
< 1 hour	12	19,4
< 2 hours	28	45,2
2- 4 Hours	17	27,4
> 4 hours	5	8,1
Using a *handphone* (X2)		
< 1 hour	0	0
< 2 hours	23	37,1
2 - 4 Hours	32	51,6
> 4 hours	7	11,3
Using a Computer (X3)		
< 1 hour	9	14,5
< 2 hours	20	32,3
2 - 4 Hours	27	43,5
> 4 hours	6	9,7

Table 3. Distribution of Digital Eye Strain Symptoms

Symptoms of DES	Frequency (n)	Percentage (%)
Dry Eye (Y1)		
Never	14	22,6
Sometimes	28	45,2
Often	20	32,3
Eye pain or strain (Y2)		
Never	21	33,9
Sometimes	23	37,1
Often	18	29,0
Burning or hot eyes (Y3)		
Never	31	50,0
Sometimes	14	22,6
Often	17	27,4
Red eyes (Y4)		
Never	29	46,8
Sometimes	12	19,4
Often	21	33,9
Blurred vision (Y5)		
Never	18	29,0
Sometimes	34	54,8
Often	10	16,1
Feeling a foreign object in the eye (Y6)		
Never	34	54,8
Sometimes	16	25,8
Often	12	19,4
Watery eyes (Y7)		
Never	15	24,2
Sometimes	35	56,5
Often	12	19,4
Headache (Y8)		
Never	15	24,2
Sometimes	24	38,7
Often	23	37,1
Neck fatigue (Y9)		
Never	14	22,6
Sometimes	23	37,1
Often	25	40,3

indicator watching television (X1) has the lowest correlation strength of 60.3%, and using a handphone (X2) has the highest correlation of 88.1%.

The indicator with the highest correlation to Digital Eye Strain is Y4 (red eyes) at 85.9% and Y7 (watery eyes) and Y8 (headache) at 68.9% have the lowest correlation to DES. The next criteria are composite reliability and convergent validity (measured by the average variance extracted (AVE) value) which are presented in Table 4.

The composite reliability of SBA and DES in this analysis shows sufficient reliability because the value is above 0.6. This means that the indicators that have been determined have been able to measure each latent variable (construct) well. The AVE value on SBA and DES >= 0.5 indicates that the AVE value is above the minimum criteria, which is 0.5. Thus it can be explained that the DES variable can explain an average of 59.6% of the variance of its nine constituent indicators as well as the SBA variable can explain an average of 59.5% of the variance of its three constituent indicators. This Outer Model analysis shows that a11 measurement models for each latent variable obtained are significant.

The second stage of analysis is carried out through a bootstrapping process to produce a structural model, called the inner model. Aims to describe whether there is a relationship between latent variables, which is evaluated using the path coefficient and R-Square. The results of the path coefficients and *t-statistic* values obtained through the *bootstrapping* process are shown in Table 5.

After bootstrapping, Table 5 shows that the t-count of 23.821 is greater than the t-table = 1.96. This indicates the validation of the relationship between SBA and DES variables, thus concluding that: SBA is predicted to affect the occurrence of DES. The correlation coefficient between SBA and DES is positive 0.818, which means that the higher the Screen Based Activity, the higher the risk of Digital Eye Strain.

Table 4. Composite Reliability and AVE Value of Measurement Model

	Composite Reliability	Average Variance Extracted (AVE)
DES	0.930	0.596
SBA	0.812	0.595

Table 5. Relationship between Variables

	Correlation Coefficient	T count
SBA -> DES	0.818	23.821

Table 6. R Square Value of Latent Variables

	R Square	R Square Adjusted
DES	0.669	0.664

According to Henseler et al. (2009) if the R^2 value > 0.67 it is said that the contribution of exogenous variables to endogenous are strong, but if the R-Square is 0.33 - 0.67, it is considered a sufficient or moderate contribution, while if the R-Square is 0.19-0.33 it is

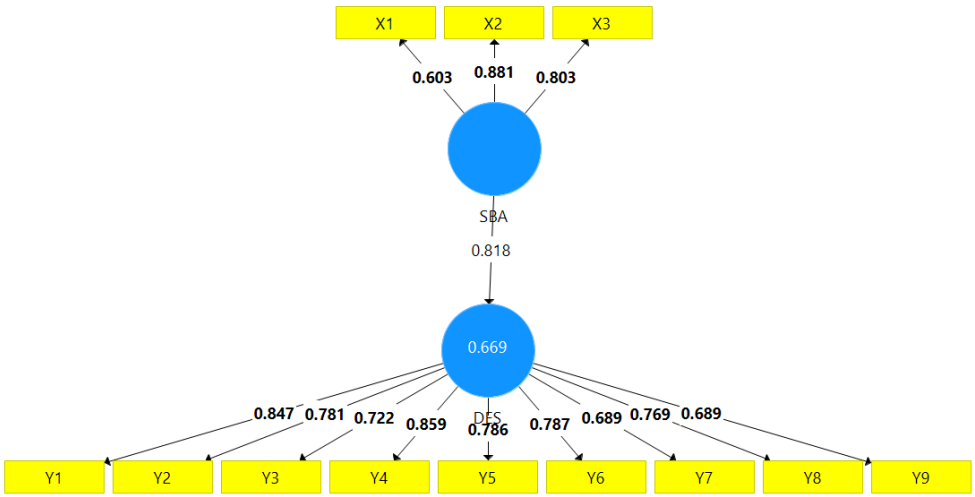

Fig.1. Path Diagram with Loading Factor Value

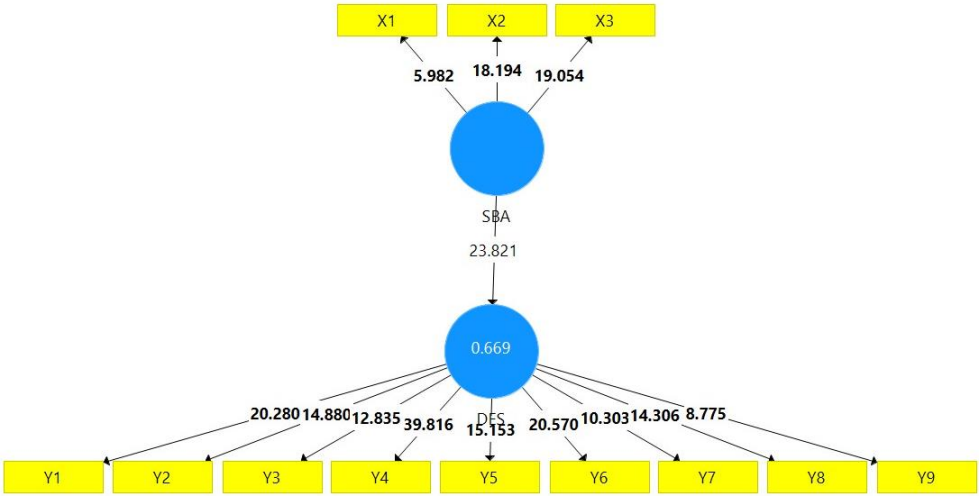

Fig.2. Structural Model (Inner Model) Relationship of Screen Based Activity with Digital Eye Strain

considered a weak contribution [13]. The *R-Square* value of this study is 0.669, so SBA as an exogenous variable has a fairly strong contribution to DES. This means that Screen-Based Activity has a fairly strong contribution to the incidence of digital eye strain.

DISCUSSION

Based on the results of this study, screen-based activity is dominated by cellphone use with a duration of more than 4 hours. Research from Wulandari (2016) shows that active smartphone users in Indonesia are around 47 million, and 79.5% are children and adolescents [14]. Even the number of mobile subscribers has exceeded the world's population, so it can be concluded that a person can use more than one connection phone [15].

Long-term use of mobile devices can have a negative impact on health, especially the visual system of the eye. Even the worst cases of exposure to electromagnetic radiation from a phone can result in eye tumors [17,18]. Parents need to monitor how much time their children spend watching television in addition to how much time they spend on handphones. One of the losses that have a negative impact due to television visibility is less than 3 times the inch diameter of the television size. Regrettably, some parents neglect to consider the recommended safe viewing distance for their children in regards to television watching [17]. In previous studies, eyestrain began to occur within 5 minutes of watching television and was quickly followed by a large increase in blink rate and a decrease in fixation. [18].

Prolonged utilization of computers at a close distance may lead to ocular fatigue and headaches, as the ciliary muscle within the eyes must exert more effort to adjust. This can cause undue strain on the eyes and result in discomfort [19].

The increase in screen-based activity in the age of technology continues to grow for the benefit of social interaction and the educational process. One health problem that arises is digital eye strain or a collection of symptoms of eye disorders due to the use of digital-based electronic devices. Eye health and prolonged screen-based activity can also affect children's mental health [20].

In this study, there are 9 (nine) symptoms related to eye disorders or digital eye strain, including dry eyes, eye pain or strain, burning eyes, red eyes, blurred vision, double vision, and feeling that there is a foreign object in the eye, watery eyes, headaches, and neck fatigue. This condition can cause discomfort and hinder daily work. Dry eye is one of the digital eye strains caused by a reduction in the number of blinks when staring at the digital monitor layer and incomplete blinking, causing tear evaporation, resulting dry eyes [21]. Some dry eye symptoms are a dry sensation, a foreign body in the eye or a gritty feeling, and a burning sensation [22]. Based on prior research, it has been suggested that reducing the duration of digital device use or taking periodic breaks can effectively mitigate symptoms of dry eye in children. This can give children the opportunity to learn and socialize without the use of digital devices [23].

Eye strain or eye fatigue is a set of symptoms of eye discomfort arising from prolonged eye use without rest. This can be caused by several factors, such as reduced contrast levels of letters compared to the background of the digital screen, glare and screen reflections, incorrect distance and angle in viewing the digital screen, poor lighting conditions, improper posture during use, and eyes that rarely blink this cause the eyes to become tense or tired [24]. In addition, the display screens of computers, electronic notebooks, smartphones and other digital devices emit significant amounts of blue light. The amount of HEV light these devices emits is only a fraction of that the sun emits. However, the time and distance the eyes are exposed to digital monitors result in adverse effects [25]. Continued exposure to blue light and glare emitted by electronic devices, along with concentrated use, can cause various symptoms of eye disorders.

Long-term use of digital devices causes symptoms of burning and sore eyes. In a survey conducted by the American Optometric Association, 80% of 200 children who used digital devices felt their eyes burning after more than 2 hours of using digital electronic devices [28]. A previous study also stated that when using digital devices, the blink rate decreased significantly. As a result, the meibomian glands are not mechanically stimulated as frequently to release the appropriate lipid layer, and the filling rate of the tear film decreases. The palpebral opening is vertically larger and the gaze angle tends to be higher when using a computer, both of which lead to rapid evaporation and inadequate blinking. Inadequate blinking makes it difficult for the tear film to spread sufficiently, leading to an unstable tear film when combined with an inadequate lipid layer, resulting in dry, gritty eyes or a foreign body feeling in the eye, burning and itching [27].

Blurred vision is also a symptom of screen-based time. Several other studies attribute this blurred vision to the use of digital devices. The Online Medical Dictionary defines blurred vision as unclear and blurred visual images or a lack of visual acuity resulting in an inability to see fine details. Blurred vision can result from disorders such as farsightedness or nearsightedness that require corrective lenses (glasses) or may indicate eye disease caused by fatigue of the eye muscles that are used continuously without adequate rest [28].

Another digital eye strain is watery eyes. The use of digital devices is associated with dry eyes. The dryness of the ocular surface stimulates the reflex arch of the 5th and 7th cranial nerves to produce excess tears. Reflex tears have a different composition to normal tears. These reflex tears are needed to lubricate the ocular surface. In this case, the eye cannot control the dryness that occurs in the eye, so the eye can react to produce more reflex tears. In addition, other ocular disorders may also cause watery eyes [28].

Headache is also one of the symptoms of digital eye strain. Previous studies mentioned that the frequency of screen band light could directly cause migraine attacks; secondly, exposure to the layer for a long time can lower the threshold of the migraine cascade. In addition, the process of constant accommodation during digital screen exposure causes the extraocular muscles to contract for a long time, resulting in stress on the head muscles and manifesting as pain or headache [29].

Another consequence of prolonged screen-based activity is neck pain. Intensive use of digital devices tends to make a person stand still in one particular position. This causes fatigue in certain muscles, especially in the muscles that support the head in the neck. This position requires repetitive movements of the upper limbs, such as typing on the keyboard and moving the mouse, but also requires static muscle activity to keep the arms in a stable position. This strain the neck, shoulder and upper limb muscles and joints. Muscles and joints will become stressed when their supporting structures are weakened. As the tissues become overloaded, ischemic cumulative injury sets in due to the conversion of endothelial xanthine dehydrogenase to xanthine oxidase. Thus, due to excessive tissue inflammation with swelling, nerve compression (i.e. median and ulnar nerve compression) and tendon and

ligament damage will give rise to adequate pain stimulation. In addition, incorrect sitting gestures will result in the overloading of the neck and shoulder muscles. The cranial nerves that exit the spinal cord through the grooves between the vertebrae can be compressed by stressed or cramped muscles. This may develop into paresthesia [30].

Digital eye strain is a common condition, especially in the digital era with the increasing use of digital devices such as computers, smartphones, and tablets. Based on previous research, digital eye strain can lead to decreased vision in children, thus disrupting the process of cognitive and mental development [24] . In this case, the parents' important role is supervising children's activities not to worsen their health conditions. [32]. Annual eye examinations are necessary to rule out refractive errors, as today's children are born into a world that has become 'closer' in the digital age [20].

Researchers suggest the need to socialize on recognising the symptoms of Digital Eye Strain and other impacts that can occur due to exposure to blue light in digital devices. The damage that occurs can be permanent to the retinal layer or eye nerves. Therefore, cooperation with Village Officials, Primary Health Care Facilities, Schools, and Religious Communities is needed, as well as approaches to parents regarding supervising children's activities, especially those related to digital devices.

CONCLUSION

There is a relationship between the duration of Screen Based Activity and the incidence of Digital Eye Strain in children. The higher the Screen Based Activity, the higher the risk of Digital Eye Strain. In addition, the use of cell phones has the highest correlation in influencing the occurrence of Digital Eye Strain in school-age children in Peniwen Village.

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CONFLICT OF INTEREST

The authors declare there is no conflict of interest regarding the publication of this article.

REFERENCES

1. Sheppard AL, Wolffsohn JS. Digital eye strain: Prevalence, measurement and amelioration. BMJ Open Ophthalmol. 2018;3(1). doi: https://doi.org/10.1136/bmjophth-2018-000146
2. Yazan G. Digital Eye Strain and Its Risk Factors Among a University Student Population in Jordan: A Cross-Sectional Study. Cureus. 2021;13(2). doi: https://doi.org/10.7759/cureus.13575
3. Zogara AU. Screen Based Activity dan Status Gizi Pada Anak Sekolah Dasar di Kota Kupang. Chmk Heal J. 2018;2(3):15–9.
4. Cheung MC, Yip J, Cheung JPY. Influence of Screen Time during COVID-19 on Health-Related Quality of Life of Early Adolescents. Int J Environ Res Public Health. 2022;19(17). doi: https://doi.org/10.3390/ijerph191710498
5. Toombs E, Mushquash CJ, Mah L, Short K, Young NL, Cheng C, et al. Increased Screen Time for Children and Youth During the COVID-19 Pandemic. Sci Briefs Ontario COVID-19 Sci Advis Table. 2022;3(59):1–19. https://doi.org/10.47326/ocsat.2022.03.59.1.0
6. Australian Parents Council. Screentime [Internet]. 2016 [cited 2022 Nov 26]. Available from: https://austparent.edu.au/wp-content/uploads/2019/03/screentime.pdf
7. Canadian Association of Optometrists. AOA CPG Pediatric Eye and Vision Examination [Internet]. 2017 [cited 2023 Jan 30]. Available from: https://opto.ca/sites/default/files/resources/documents/aoa_cpg_pediatric_eye_and_vision_examination_2017.pdf
8. Wong CW, Andrew Tsai, Jonas JB, Ohno-Matsui K, Chen J, Ang M, et al. Digital Screen Time During the COVID-19 Pandemic: Risk for a Further Myopia Boom. J Ophthalmol [Internet]. 2020;21(1):333–337. Available from: http://journal.um-surabaya.ac.id/index.php/JKM/article/view/2203. doi: https://doi.org/10.1016/j.ajo.2020.07.034©
9. Munsamy AJ, Moodley M, Khan Z, Govender K, Nkwanyana M, Cele S, et al. Evidence on the effects of digital blue light on the eye: A scoping review. African Vis Eye Heal. 2022;81(1):1–9. doi: http://doi.org/ 10.4102/aveh.v81i1.685
10. Ariyanti KS, Sariyani MD, Viqtrayana IPE, Winangsih R. The Relationship Between Gadget Usage and Adolescents Eye Health. Nurs Heal Sci J. 2022;2(3):211–4. doi: http://doi.org/10.53713/nhs.v2i3.129
11. Zhao ZC, Zhou Y, Tan G, Li J. Research progress about the effect and prevention of blue light on eyes. Int J Ophthalmol. 2018;11(12):1999–2003. doi: http://doi.org/10.18240/ijo.2018.12.20
12. Ghozali I. Metode Alternatif Dengan Partial Least Squares (PLS),. Semarang: Universitas Diponegoro; 2014.
13. Henseler J, Ringle CM, Sinkovics RR. THE USE OF PARTIAL LEAST SQUARES PATH MODELING IN INTERNATIONAL MARKETING. Emerald Gr Publ Ltd. 2004;20(2009):277–319.
14. Wulandari. Anak Asuhan Gadget [Internet]. 2016. Available from: https://www.liputan6.com/health/read

/2460330/anak-asuhan-gadget
15. Mitra R, Pattanayak S. Mobile Phone And Tower Radiation: A Challenge To All Living Entities. Explor Anim Med Res. 2018;8(1):5–10.
16. Noaman AA. Impact of Mobile Phone Usage on Some Health Aspects of Children and Adolescents: Evidence Based Review Article. J Med Res. 2019;5(4):159–61. doi: http://doi.org/10.31254/jmr.2019.5406
17. Agusli R, Setiyanto R, Maulana F. Sensor Jarak Aman Saat Menonton Televisi Pada Anak Berbasis Arduino. J Sisfotek Glob. 2021;11(1):8. doi: http://doi.org/10.38101/sisfotek.v11i1.338
18. Shariati A, Liao K, Yu C, Witthayaweerasak J, Chang RT, Sun M-H, et al. Eye Fatigue During TV Watching: An Infrared Oculography Study of Linearly vs. Circularly Polarized LCD TV. Invest Ophthalmol Vis Sci. 2016;57(12):4591.
19. Agarwal S, Goel D, Sharma A. Evaluation of the factors which contribute to the ocular complaints in computer users. J Clin Diagnostic Res. 2013;7(2):331–5. doi: http//doi.org/10.7860/JCDR/2013/5150.2760
20. Munsamy AJ, Chetty V, Ramlall S. Screen-based behaviour in children is more than meets the eye. South African Fam Pract. 2022;64(1):1–4. doi: http//doi.org/10.4102/safp.v64i1.5374
21. Akkaya S. The Effect of Long Term Computure Use on Dry eye. North Clin Istanbul. 2018;5(4):319–22. doi: http//doi.org/10.14744/nci.2017.54036
22. Rapoport Y, Singer JM, Ling JD, Gregory A, Kohanim S. A Comprehensive Review of Sex Disparities in Symptoms, Pathophysiology, and Epidemiology of Dry Eye Syndrome. Semin Ophthalmol. 2016;31(4):325–36. https://doi.org/10.3109/08820538.2016.1154168
23. Prescott CR. Increased Screen Time and Dry Eye: Another Complication of COVID-19. Eye Contact Lens. 2021;47(8):433. doi: http//doi.org/10.1097/ICL.0000000000000820
24. Kaur K, Gurnani B, Nayak S, Deori N, Kaur S, Jethani J, et al. Digital Eye Strain- A Comprehensive Review. Ophthalmol Ther [Internet]. 2022;11(5):1655–80. Available from: https://doi.org/10.1007/s40123-022-00540-9
25. Taylor RS, Dalal HM, McDonagh STJ. The role of cardiac rehabilitation in improving cardiovascular outcomes. Nat Rev Cardiol. 2022;19(3):180–94. doi: http//doi.org/10.1038/s41569-021-00611-7
26. Rosenfield M, Mcoptom MR. The speed and significance of Stereoscopic perception View project Computer vision syndrome (a.k.a. digital eye strain). Optom Pract [Internet]. 2016;17(February):1–10. Available from: https://www.researchgate.net/publication/295902618
27. Balasopoulou A, Kokkinos P, Pagoulatos D, Plotas P, Makri OE, Georgakopoulos CD, et al. Symposium Recent advances and challenges in the management of retinoblastoma Globe - saving Treatments. BMC Ophthalmol [Internet]. 2017;17(1):1. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28331284%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC5354527%5Cnhttp://bmcpsychiatry.biomedcentral.com/articles/10.1186/1471-244X-11-49%5Cnhttp://bmcophthalmol.biomedcentral.com/articles/10.1186/s12886
28. Akinbinu TR, Mashalla YJ. Medical Practice and Review Impact of computer technology on health : Computer Vision Syndrome (CVS). Acad Journals. 2014;5(November):20–30. doi:http//doi.org/10.5897/MPR.2014.0121
29. Abou Hashish EA, Baatiah NY, Bashaweeh AH, Kattan AM. The online learning experience and reported headaches associated with screen exposure time among Saudi health sciences students during the COVID-19 pandemic. BMC Med Educ [Internet]. 2022;22(1):1–13. Available from: https://doi.org/10.1186/s12909-022-03235-8
30. Ming Z, Närhi M, Siivola J. Neck and shoulder pain related to computer use. Pathophysiology. 2004;11(1):51–6. doi: http//doi.org/10.1038/s41569-021-00611-7
31. Rudhiati F, Apriany D, Hardianti N. Hubungan Durasi Bermain Video Game Dengan Ketajaman Penglihatan Anak Usia Sekolah. J Sk Keperawatan. 2015;1(2):12–7. doi: http//doi/org/10.35974/jsk.v1i2.83
32. Supriyanto S, Wartiningsih M, Kodrat DS, Djuari L. Administrasi Rumah Sakit. Sidoarjo: Zifatama Jawara; 2023.