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The Impact of Gadget Use on Visual Abilities of School-Age Children: A Literature Review

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ABSTRACT

Background: The use of gadgets for school-age children is useful for supporting the learning process, but excessive use is at risk of disrupting vision function if used for too long and can cause eye problems, including visual abilities. This can be caused by the level of use of gadgets in children. **Purpose:** The purpose of this study was to identify the impact of using gadgets on the visual ability of school-age children, especially those aged 6-12 years. **Methods:** The research design used in this literature study is a narrative review. The data collected in this study used secondary data from literature searches with online article search tools through databases, namely PubMed, SpringerLink, ScienceDirect, ProQuest, and Google Scholar. Article selection is carried out through 4 stages according to the PRISMA flowchart. **Results:** There are 10 articles analyzed in this study. The use of gadgets has an effect on decreasing the visual ability of school-age children due to frequent use for a long time. An overview of the impact of the use of gadgets on the visual ability of school-age children can be influenced by several factors, including the level of use which indicates the frequency and duration which indicates how often. **Conclusions:** The adverse effects of excessive use of gadgets on school-age children can be prevented by limiting the use of gadgets.

KEYWORDS

Gadget, Visual ability, School age children, Family

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1. BACKGROUND

Gadgets provide many benefits for their users. One of them is gadget users will find it easier to get the latest information by accessing the internet or other applications. School-age children with an age range of 6-12 years are also called the intellectual period with the age of 6-7 years being considered a mature child to enter school (Pambudi, 2015). According to WHO data, the estimated number of children under 19 years of age experiencing visual impairment is 312 million with 265 million to 369 million children experiencing myopia in 2015 (Shimizu, 2019). It is estimated that the prevalence of visual impairment in the uncorrected age group of children (<18 years) is 30% in the world. Visual impairment

in children will have an impact on long-term health, school performance, and emotional and social development (Boston Consulting Group and Essilor, 2012).

Based on a survey by the Indonesian Internet Service Providers Association (APJII) in 2017, as many as 54.68% of the 262 million Indonesian population use the internet and gadgets are the most widely used devices to access the internet as many as 44.16% (APJII, 2017). Internet and online gaming addiction rates have increased by 31.2% in Africa, 46.7% in Asia, 80.2% in Europe, 62.4% in Latin America, 58.7 in the Middle East, 88.1% in North America, and 69.6% in Australia (Taş, 2017). The habit of playing online games is one of the most popular activities to fill spare time which has an impact on the occurrence of addiction if done for a long time so that it can lead to a sedentary lifestyle behavior (Mulyaningsih et al., 2020).

Continuous use of gadgets in children can adversely affect behavior patterns in their daily lives, so children tend to depend on using gadgets and make routines in daily activities (Pratiwi et al., 2020). The other negative impact is decreased visual function. Exposure to gadget screens causes dry eyes, tears always come out, and headaches (Pertiwi et al., 2018). This can be caused by radiation rays from the glow of the gadget. Radiation rays are in the form of heat, particles, or electromagnetic waves that originate from radiation. Gadget radiation will be felt in the eyes when looking at gadgets for a very long time so that when the eyes feel tired, the heat energy from the radiation will settle in the eyes and potentially damage eyesight (Adib, 2021). Therefore, the impact of using gadgets is expected to interfere with visual function if used for too long and can cause eye problems, including visual abilities.

2. METHODS

The design of this research is a literature review study. The keywords used are gadget, visual ability, and school-age children. The article search process went through 3 stages based on the PRISMA flowchart (Figure 1). This literature search uses keywords or keywords for the article to be searched reviewed according to the problem formulation that has been determined by the researcher, namely "an overview of the impact of gadget use on the visual abilities of school-aged children". Search for sources in English: (“impact” OR “effect” OR “addiction”) AND (“use of gadget s” OR “smartphone use”OR “smartphone effect” OR “smartphone

addiction") AND ("visual acuity"OR "visual ability") AND ("children" OR "elementary school" OR "elementary school children" OR "school children" OR "school age" OR "school age children").

INCLUSION AND EXCLUSION CRITERIA

The inclusion criteria were: 1) The population in the analyzed articles was school age 6-12 years, 2) Articles written in Indonesian or English, 3) Articles between January 2017 – March 2022, 4) Study of measuring the use of gadgets (smartphones) using questionnaires or interviews, 5) The visual ability of children is measured using Snellen charts, 6) The research topic is the use of gadgets related to the visual abilities of school-age children, 7) Quantitative research design, 8) The article is the result of research. Exclusion criteria include 1) Studies that are not by the research topic, 2) Articles resulting from conferences or proceedings, 3) Articles that are not full-text, 4) Articles found to be published in two or more journals or duplication, 5) Articles withdrawn or withdrawn. from journals for violations of publication ethics.

DATA EXTRACTION

The first stage of the article search used the keywords as many as 1,589 articles: PubMed: 16; Spinerlink: 196; ScienceDirect: 161; ProQuest: 364; Google Scholar: 852. In the second stage, 1,566 articles were published because they were not on topic, leaving 23 articles on the topic. Articles were screened based on inclusion and exclusion criteria. 3 articles were published, 1 article did not contain the full text, 1 article in proceedings, with a thesis, and 1 article was published in 2017. 10 articles were excluded because 1 article was under 6-12 years old, 3 articles were research subjects over the age range of 6- 12 years, and 6 articles were published/reviewed. The total articles obtained and the criteria taken are 10 articles.

QUALITY APPRAISAL

Paper selection in this research was carried out in four stages based on PRISMA 2020 flow diagram which consists of identification with A literature search process was carried out through the database using keywords According to the problem on the research study topic, screening is carried out the process of sorting papers or articles based on keywords, title and abstract, and Included by entering the results of sorting relevant previous papers as secondary data. The following is an explanation of the stages for

selection articles in the literature review in this study:

Identification

The identification stage is the process of identifying articles that have been found after conducting a data-based literature search using keywords that have been specified in the search method above to answer problem formulation "how to describe the impact of using gadgets on visual abilities of school-age children". The search stage is carried out through the database PubMed, SpringerLink, ScienceDirect and Google Scholar.

Screening

At this stage, the article filtering process is carried out based on keywords, title, abstract and appropriateness of the topic of the literature review study. The resulting articles were reviewed further and filtered again using exclusion criteria such as studies that deviate from the research topic, articles published between January 2017 – March 2022, articles from conferences or proceedings, articles that only contain abstracts, articles that are not full-text, articles found published in two or more journals or duplicates, as well as retracted articles or withdrawn from the journal due to violations of publication ethics. Articles that don't eligible for inclusion in the review the studies were rejected and performed recording the number of articles rejected during the screening stage. Articles that have been screened will continue to the eligibility stage. Stages eligibility requires reading the full text of the article to determine suitability of articles that are relevant to research. At this stage, selection begins filtered by focusing on articles that met the inclusion and exclusion criteria. The articles to be reviewed are analyzed again with Inclusion criteria include, the population in the articles analyzed is children 6-12 years of school, articles written in Indonesian or English. The research design used is quantitative and qualitative, visual ability Children are measured using the Snellen chart, the topic of study is the use of gadgets related to the visual abilities of school-aged children, and the article is the result study. Articles that meet the feasibility aspects are reviewed further review.

Included

The Included stage is the researcher's final stage in entering articles which have been found and fulfill the research study topic and are determined by criteria will be accepted as a review of this literature study. Articles must meet the topic of study, namely impact the use of gadgets related to the visual abilities of school-aged children.

After going through several review processes until the suitability of the article was found a number of relevant articles on the topic of research studies so that these articles which will be used and analyzed in this literature review. Article selection process studies can be depicted in the PRISMA diagram through three stages.

DATA ANALYSIS

Analysis of articles in the literature review process is carried out by reading the results research the article comprehensively, focused, and sequentially, then create summary, and concluding articles that have been read and analyzed for get answers, gaps, and problems related to research results. After getting relevant articles and has been read, abstracted and criticized, then analyzed and synthesized. Article analysis was carried out in several stages, namely first search for articles using several keywords in databases including PubMed, SpringerLink, ScienceDirect and Google Scholar then identified the articles according to the inclusion criteria. Second, filtering articles based on title, abstract as well as inclusion and exclusion criteria based on topic and problem formulation.

Then the articles that pass the screening process are studied further. Third, study the rest of the article by reading the full text of the article to determine the article's appropriateness relevant to the research then count the number of eligible articles. Fourth namely reviewing all full-text articles according to the inclusion criteria which will then be found a number of articles that meet the inclusion criteria according to the topic of this research study. The next worthy article is summarized and arranged into research results consisting of introduction, content and conclusions.

The strategy for writing literature review articles is carried out in several stages which begins with problem formulation by choosing a topic, searching relevant literature according to the research topic, evaluate the findings, analyzing and interpreting data. There is Several techniques in reviewing literature, namely comparison (looking for similarities), criticize (giving views), contrast (looking for things dissimilarities), synthesize (comparing) and summarize (summarizing). Based on the problem formulation and objectives in this literature study, then The article analysis technique used is to carry out a summary or summarizes previous research articles related to the impact of gadget use on the visual abilities of school-aged children. Preparation of this literature

review by the author will look for similarities and draw conclusions from several pieces of literature taken.

The stages in this literature study are as follows: 1) Look for similarities in literature related to the topic of children's gadget use School age is then described as a description of gadget use school age children; 2) Look for similarities in literature related to the topic of children's visual abilities school age which is then described as a problem visual abilities of school-aged children; 3) Look for similarities in the literature regarding the impact of using gadgets on the visual abilities of school-age children is then described as a description of the impact of gadget use on the visual abilities of school-aged children.

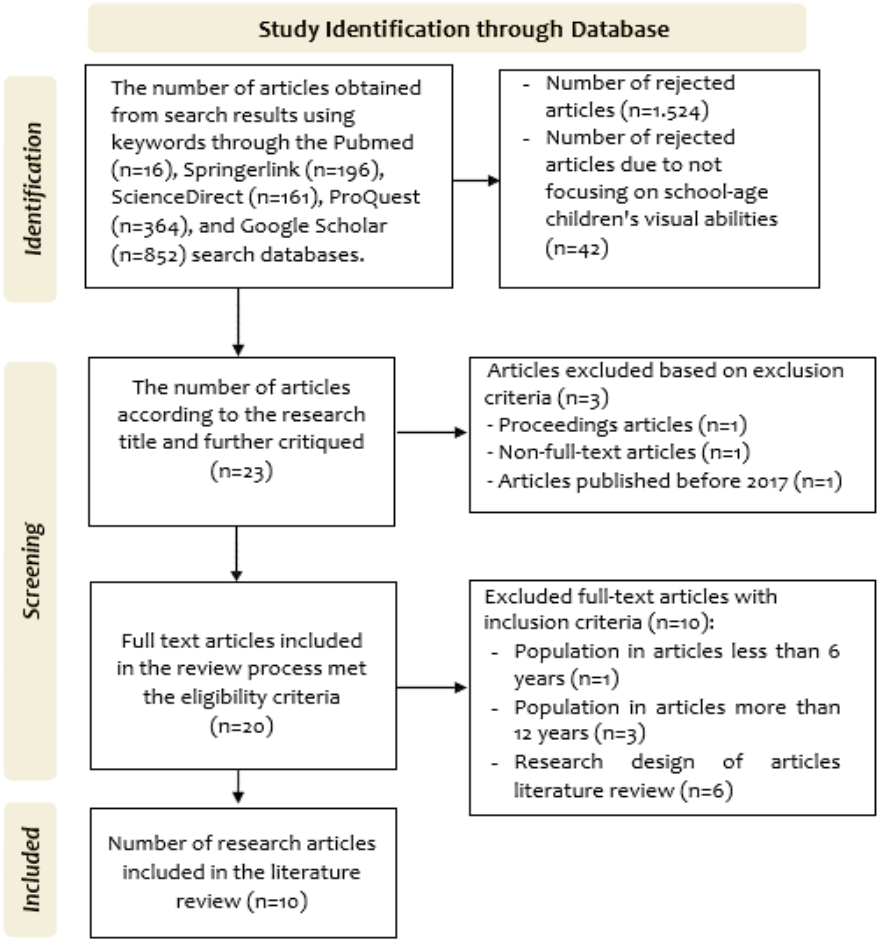

Figure 1. PRISMA flow chart

3. RESULT

Based on the results of article selection through the PRISMA flowchart stage, 10 articles were found that will be discussed in this literature review study. The whole article contains the Impact of Gadget Use on the Visual Abilities of School Age Children. Based on the study design, 2 articles

included descriptive research, 4 correlational research articles, and 4 observational research articles. Based on the research location, 8 articles were in Indonesia, 1 article in the United Arab Emirates, and 1 article in Japan (table 1).

Table 1. The literature search results (Continue to page 196-197)

No	Title	Design	Subject	Measurement	Findings/Results
1.	Gambaran Penggunaan Gadget pada Anak Berkacamata di Sekolah Dasar Millatun Nadlifah, Indriatie, Aida Novitasari (2018)	The research design used is descriptive	School children in grades 1-6 at SDN Kapasari 8 Surabaya	The instruments used in this study were observation and questionnaires.	The results of this study indicate that children who wear glasses at Kapasari 8 Elementary School, Surabaya, almost all use gadgets in the wrong position, most of them use gadgets with the wrong frequency, viewing distance and lighting intensity.
2.	A Cross-Sectional Study on the Use of Near-Visual Display Device in The Middle-Eastern Children Population Thuraya N. Maher, M. Irfan Khan, Noor Azzam (2022)	The type of study used a questionnaire about demographic aspects, symptoms, awareness of dangers, and healthy practices related to NVDD use.	Involving 260 children between the ages of 4 and 16 years	The research instrument used a questionnaire on demographic aspects, symptoms, awareness of dangers, and healthy practices related to NVDD use.	Daily use, prolonged viewing (for 3 hours or more), and use of multiple near-visual screen devices or NVDD (2 or more) were seen in the majority (79.6%, 90%, and 71.5%, respectively). The most commonly used devices were smartphones, tablets, and iPads. Symptoms of eye disorders were present in 92.3%. The association between symptom occurrence and duration of digital screen exposure was statistically significant (P < 0.00001). Symptoms of itching (40.0%), watery eyes (31.0%), burning sensation (24.0%), headache (22.0%), excessive blinking (20.0%), dry eyes (20.0%), foreign body sensation (10.0%).
3.	The Changes in Visual Acuity Values of Japanese School Children during The Covid-19 Pandemic Shingo Noi, Akiko Shikano, Natsuko Imai, Fumie Tamura, Ryo Tanaka, Tetsuhiro Kidokoro & Mari Yoshinaga (2022)	The type of research used quantitative analytics with a cross-sectional research design.	5,893 school children, in seven public elementary schools and four public junior high schools in Tokyo, Saitama, Kanagawa, and Shizuoka	Data collection using questionnaire sheets and measuring visual ability	Compared with 2019 data obtained before the start of the pandemic, data obtained during the pandemic in 2020 showed that more children had poor visual acuity, with worsening visual acuity in children who already had poor vision. This is related to lifestyle during the COVID-19 pandemic which can affect children's visual acuity and eye laterality. Therefore, it is recommended to prioritize children's eye health and place greater emphasis on monitoring and preventing myopia progression. Interventions should
4.	Hubungan Penggunaan Gadget dengan Visus Mata pada Siswa/i Kelas VI SD Harapan 2 Medan Tahun 2019 Maharani Pertiwi,	The type of research used quantitative analytics with a cross-sectional research design.	Students of grade VI at SD Harapan 2 Medan	Primary data collection using questionnaires and examination of students' vision using Snellen charts and direct observation.	The results of the study stated that there was no relationship between gadget use and visual acuity of grade VI students of SD Harapan 2 Medan in 2019, where the p value (0.963) > α (0.05). The results of the Spearman rank test found that

No	Title	Design	Subject	Measurement	Findings/Results
	Nuriama Siregar (2020)				all levels of exposure groups only had a small risk or even no risk of experiencing decreased visual acuity. This is because in the use of gadgets, grade VI students of SD Harapan 2 Medan in 2019 are still under the supervision of parents and the school in accessing gadgets so that children only use them at certain times. This can also be influenced by other factors, such as the anatomy of the eyeball and hereditary factors of parents.
5.	Pengaruh Penggunaan Gadget terhadap Penurunan Kualitas Penglihatan Siswa Sekolah Dasar Andriana Kirana Puspa, Rozalina Loebis, Djohar Nuswantoro (2018)	Type of analytical research: cross-sectional observational research	There are 43 subjects of 11-year-old students at Muhammadiyah 4 Elementary School, Surabaya.	This research instrument used a questionnaire as well as a Snellen Chart eye examination and tear break-up time test.	The questionnaire results obtained mild exposure categories of 56%, moderate 23%, and severe 21%. Snellen chart examination obtained results of decreased visual acuity in 47% and normal in 54%. The results of the tear break-up time test obtained dry eyes in 88% and did not experience as much as 12%. Snellen chart examination showed decreased vision in 47% and normal in 54%. The results of the tear break-up time test obtained dry eyes in 88% and did not experience 12%.
6.	The Effect of Long Exposure to Smartphone Light on Visual Acuity and Dry Eyes of Students at Al-Irsyad Elementary School, Surakarta City Windy Patadungan, Senyum Indrakila, Raharjo Kuntoyo (2021)	The study used analytical observation with a cross-sectional approach.	Grade VI students of Al-Irsyad Elementary School	Data collection using questionnaire instruments and visual acuity examination using the Snellen Chart	There is an effect of the duration of smartphone light exposure in years on visual acuity and there is no effect of the intensity of smartphone light exposure (hours) in a day on visual acuity. There is an effect of the intensity of smartphone light exposure accumulated into years on dry eyes.
7.	The Relationship Between Gadget Use and Decreased Visual Acuity in School-Age Children at the Sunan Kudus Hospital Eye Clinic Tutik Emi Tafiyah, Sri Hartini, Biyanti Dwi Winarsih (2021)	The research design uses a quantitative approach with correlation studies.	School-age children (6-12 years) who visit the RSI Sunan Kudus Polyclinic	The research instrument used a questionnaire and medical record sheets.	There is a relationship between the level of gadget usage and visual impairment in children of RSI Sunan Kudus with a p-value of 0.008. Most of the gadget usage is in the high category as much as 69.7% and most of the visual impairment is in the abnormal category as much as 78.8%.
8.	The Relationship Between Gadget Use and Visual Acuity in Grade IV and V Children at SD Gamaliel Makassar Jira & Mahyudin (2019)	The research used a quantitative descriptive design with a cross-sectional approach.	Students in grades VI and V at Gamaliel Elementary School, Makassar	The instrument uses a questionnaire and observation using a Snellen chart.	The results of the study stated that the chi square statistical test showed a significant value of 0.000. where the p value (0.000) < from the α value (0.05) then Ho is rejected and Ha is accepted which means there is a relationship between gadget use and visual acuity in grade VI and V students at SD Gamaliel Makassar. The

No	Title	Design	Subject	Measurement	Findings/Results
					conclusion of this study is that gadget use is related to visual acuity.
9.	Evaluation of the Duration of Use on Visual Acuity in Elementary School Children in the Covid-19 Pandemic Era Bayu Lakmana Jati, Mahyar Suara (2022)	The research design used is descriptive correlational analytic which is "cross sectional" in nature.	9 year old school children at Jatikramat V State Elementary School	Data collection using questionnaire instruments	Most of the respondents' gadget usage is in the high category, as many as 23 respondents (69.7%). Most of the respondents' visual impairment is in the Myopia category, as many as 26 respondents (78.8%). Conclusion: There is a relationship between the level of gadget usage and visual impairment in children at Jatikramat V Elementary School with a p-value
10.	The Relationship Between Duration of Use, Viewing Distance and Body Position When Using Gadgets with Visual Acuity in Grade 5 and 6 Children at SDK Citra Bangsa Kupang Nur Putri Hidayani, Florentianus Tat, Herliana M.A Djogo (2020)	The type of research used is correlational research using a cross-sectional research design.	Grade 5 and 6 children at SDK Citra Bangsa Kupang with a sample of 110 respondents taken	Data collection using questionnaire sheets, observation sheets, measuring tapes and Snellen chart cards	The results of the study showed that there was a significant relationship between the duration of gadget use and visual acuity in children in grades 5 and 6 at SDK Citra Bangsa Kupang with a p value = 0.000, there was no relationship between viewing distance and visual acuity in children in grades 5 and 6 at SDK Citra Bangsa Kupang with a p value = 0.071 and there was no relationship between body position and visual acuity in children in grades 5 and 6 at SDK Citra Bangsa Kupang with p = 0.445.

According to research by Nur et al., (2020) it was found that 54% of 5th and 6th graders (10-12 years) at the Citra Bangsa Kupang SDK used smartphone-type gadgets (Hidayani et al., 2020). The results of the study by Patadungan et al., (2021) also stated that the dominant smartphone users at the age of 11 years were 56.6% and at the age of 12 years (32.1%) (Patadungan et al., 2021). The highest device ownership for smartphones is 70% in Middle Eastern children (Maher et al., 2021). The use and ownership of gadgets are more than or equal to 2 years more, which is 85% (Hidayani et al., 2020). The percentage of children who use gadgets every day (80%) is higher than those who only use them on weekends (20%) (Maher et al., 2021). The use of gadgets used by school-age children is used for playing by 88% and others (learning, watching videos, etc.) by 12% (Nadlifah et al., 2018).

The use of gadgets in Pertiwi's research (2020) is categorized into three out of three frequencies, namely the frequent intensity of as much as 55.6%, intensity always as much as 22.2%, and intensity of as much as 17.8% and never using gadgets as much as 4.4% (Pertiwi, 2020). The results of

Tafiyah's research (2021) also stated that the frequency of using gadgets in the high category was 69.7% and the medium category was 30.3% (Tafiyah et al., 2021). The results are based on research by Bayu and Mahyar (2022) that most of the use of gadgets at the age of 9 years is 69.7% with a high intensity of use (Jati & Suara, 2022).

The duration of smartphone use for grade VI elementary school children (11-12 years) is around 67.9% using smartphones for 2-4 hours per day and use of more than 4 hours per day is around 32.1% whereas prolonged use of smartphones is due to blue light produced causes eye irritation. Smartphone usage that has accumulated over years shows that 86.8% have used smartphones for more than 3 years and 13.2% have used smartphones for 1-3 years (Patadungan et al., 2021). The duration of daily use of gadgets by school children in the Middle East to watch for a long time (for 3 hours or more) using more than one device, namely 90% smartphones, 79.6% tablets, and 71.5% iPads (Maher et al., 2021).

There is a difference in vision between children who use gadgets who do not use gadgets, it appears that those who use gadgets with normal vision are 12 children, almost normal 19 children, and low vision abilities 26 children (Jira & Mahyudin, 2019). Most of the high-use of gadgets experienced abnormal vision as much as 92% of children aged 9 years (Jati & Suara, 2022). The effect of gadget exposure on visual ability with light exposure is 56%, moderate exposure is 23% and heavy exposure is 21% (Puspa et al., 2018).

Visual symptoms arising from exposure to gadgets most often experience dizziness as much as 28% with mobile phones as the most common cause (Puspa et al., 2018). The intensity of smartphone use of school children aged 12 years (6th grade) 67.9% use smartphones 2-4 hours per day and 32.1% more than 4 hours per day. Symptoms of eye disorders that can arise include blurring of the eyes, red eyes, episodes, and hot eyes. Individuals who have smartphone light exposure >4 hours per day have a 7.7 times greater risk of experiencing dry eyes compared to individuals who are exposed to smartphone light for 2-4 hours per day. However, smartphone light exposure in a day (hours) has no effect on visual ability (Patadungan et al., 2021). The results of the study by Tutik et al., (2021) showed that the use of gadgets was experiencing abnormal vision problems as much as 50% and high gadget use experienced abnormal vision as much as 92% (Tafiyah et al., 2021). According to Jira and

Mahyudi's research (2019), there is a difference in place between frequent use gadgets and those who rarely use gadgets. Frequent use of gadgets with low vision is 53.3% which shows a relationship between gadget use and the eyesight of fourth and fifth-grade students (9-11 years old) (Jira & Mahyudin, 2019).

4. DISCUSSION

Gadgets themselves generally have benefits and functions according to their use, such as being used as a medium to obtain various news, news, and stories as well as as a medium to communicate easily, quickly, and more efficiently using mobile phones. Along with the times, the current teaching and learning process is not only focused on books but on gadgets that can access various necessary knowledge about religion, education, and even politics (Ariston & Frahasini, 2018). Access to gadgets for school-age children is used to watch movies or videos, play games, listen to songs, or just open applications available on gadgets (Mardiana et al., 2019). Two basic things in the use of gadgets in school-age children, namely the frequency which indicates the level or how often individuals use gadgets, and the duration of accessing gadgets. by individuals. Some research results show that some school-age children use gadgets with frequent intensity where their use is carried out by individuals who have gadgets personally so that they can be used anytime (Mardiana et al., 2019). Staring at a gadget screen for a long time puts additional pressure on the eyes and nervous system so that it is related to the duration of radiation exposure to the eyes which in the long term can be at risk of causing physiological disturbances (Anwari et al., 2018).

The interaction between parents and their children in the family system is complex (Susanto et al., 2018). Family involvement, especially among parents of children, plays an important role in the use of gadgets which in addition to providing but also help to control their use by limiting "screen time" (Terras & Ramsay, 2016). Screen time is defined as the duration of time used to carry out activities in front of electronic media screens such as gadgets (Jira & Mahyudin, 2019). The proportion of screen time or the use of screens such as gadgets in children and adolescents that do not exceed the recommended limit is one of the goals for the health of children and adolescents (Nies & McEwen, 2019). The role of the family that can be done in controlling or supervising the use of gadgets in children is limiting the time

of using gadgets, being more selective in sorting out gadget applications for children, assisting children in using gadgets, and inviting children to interact socially (Hidayatuladkia et al., 2021). Families with school-age children can avoid the risk of the impact of using gadgets too often by inviting children to play outdoors or indoors to reduce the use of gadgets. Families or parents can teach children in a sitting position with enough light to illuminate so that it is considered the best position when using gadgets and a good distance when viewing gadgets is 30-40 cm. Restrictions on the use of gadgets can be applied by parents to children, namely for 2 hours every day and the lighting should not be too bright so that the eyes do not get tired easily. The use of gadgets with intensity is often at risk of eye problems. This can be avoided by resting for 30 minutes to look away and blinking frequently to avoid dry and irritated eyes (Tafiyah et al., 2021).

Based on research by Patadungan et al. (2021) stated that the intensity of long exposure to smartphone light (hours) in a day affects the occurrence of dry eye symptoms. Long exposure to smartphone light in years affects visual acuity where users who are exposed for>3 years have an 8.5 times greater chance of experiencing a decrease in visual ability (<6/6) compared to those exposed to smartphones for 1-3 years only. The existence of this relationship is because smartphones emit high visible energy (heV) which is a blue light found in gadget light that has short waves and large energy so that it can contribute to causing eye disorders. The incidence of dry eye in individuals with smartphone light exposure intensity >3 hours per day has a risk of 7.7 times greater than individuals exposed for 2-4 hours per day. Dry eyes can occur due to a decrease in the blinking reflex of the eye, resulting in low tear production and temporarily straining the cornea, resulting in dry eyes. There is an effect of long exposure to gadgets, especially smartphones that are accumulated over the years having a greater risk of experiencing a decrease in visual ability (Patadungan et al., 2021). This can be interpreted that the higher the level of long use of the gadget, the greater the decrease in visual ability.

Visual acuity which is defined as a person's ability to see objects clearly at near or far distances using normal eyes, usually 6 meters or 20 feet. Factors that can affect the visual ability of the eye are lighting, color combinations of objects, light contrast, and refractive errors (Pertiwi, 2020). Considering the negative impact of excessive use of

gadgets on children's eye health, it is necessary to pay attention to the position when playing with gadgets, duration of use, and the intensity of lighting on the gadget screen so that the visual ability of children is maintained sharp (Jati & Suara, 2022). Changes that occurred during the pandemic affected the digitalization of education where learning activities during the Covid-19 period required the routine of working and studying for parents and children which was previously done face-to-face, now turned online using the features provided on the gadget application to make learning easier. This triggers the use of gadgets for a very long time (Sopiah, 2021).

Eye disorders due to gadgets in school-age children are caused by playing games or watching videos with a long enough duration, then the ciliary muscle in the eye will affect the lens to become convex because they often see close objects so they are less sensitive to distant objects, that is what causes impaired ability vision. The position between the body and the gadget is too close, causing the body to be unable to relax because the eye muscles will pull the eyeball downward following the location of the gadget so that the eyes are accommodated for a long time, which will accelerate the decline in the ability to see far away. Poor use of gadgets causes other eye disorders such as dry eyes, eye fatigue (asthenopia), and nearsightedness (myopia) (Mardiana et al., 2019). The tendency to use gadgets with the use of gadgets with infrequent intensity, a small proportion of them have normal visual acuity and frequent intensity, and most of them have low visual acuity (Jira & Mahyudin, 2019). The absence of the effect of the frequency of using gadgets on the decline in the visual ability of school-age children can be influenced by the time lag in using gadgets, allowing the eye muscles to rest to avoid eye fatigue (Pertiwi, 2020).

Preventive and rehabilitative efforts in children who have decreased visual abilities or are unable to carry out eye examinations at available health facilities. Eye examinations in children with visual impairments are needed to determine the cause of eye disorders that result in decreased visual ability. The most common and practical and efficient examination is to use the Snellen-chart. The visual ability examination method commonly used is the Snellen chart, which is a special tool in the form of letters (Mardiana et al., 2019). Visual inspection with the Snellen chart is done by reading the smallest letters by eye at a distance of 6 meters. If the individual can

read the letter to the bottom line, then it is judged which line he can read. The cause of decreased visual ability needs to be distinguished whether it is caused by neurological disorders or abnormalities in the eye (ophthalmologic) (Satyanegara et al., 2014).

The impact of bad use of gadgets can be avoided by involving families in directing children to prevent excessive use of gadgets causing addiction so that children are lazy to socialize, do not want to play outside the home, and refuse to do activities. The involvement of interactions between parents and children in the family can be done by helping and encouraging children in socializing or by doing activities outside the home to achieve their intellectual development.

5. CONCLUSION

Some research results show that some school-age children use gadgets with frequent intensity because they have gadgets personally so they can use them anytime. Excessive use of gadgets or frequent intensity and inappropriate lighting positions and intensity can affect children's eye health. The existence of a relationship between the impact of using gadgets and the visual ability of school-age children is caused by several factors such as the position of the gadget with the eyes too close, the position of the body when using the gadget, insufficient lighting, and the brightness of the gadget screen that is too bright. This is done continuously and can cause other disorders in the eye. The long duration of using gadgets is at risk of experiencing eye disorders such as experiencing blurry eyes, red, watery eyes, hot eyes, and dry eyes and the use of gadgets for years affects the decrease in visual ability.

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AUTHOR CONTRIBUTIONS

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DECLARATION OF INTEREST

The authors declare no conflict of interest regarding the publication.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from corresponding author.

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