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The Effect of Screen Time on Delays In Language and Speech Developmental Children: Meta-Analysis

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ABSTRACT
Language is a communication tool that humans often use. In the current globalisation era, finding and exchanging information takes effort. This is of course because of progress in the era of globalization, everything has become more accessible and easier because of gadgets Excessive and uncontrolled use of gadgets can have a negative impact on children's psychology and development, especially on their social and communication skills. This research aims to determine the average effect of screen time on language and speech disorders in children. This research is a systematic study and meta-analysis. The articles used in this research were obtained from several databases, including PubMed, Science Direct, and Google Scholar. Based on the results of the case-control study design show that screen time increases language and speech delays in children by 2.67 times compared to no screen time and has statistical significance (p < 0.00001). The cross-sectional subgroup results show that screen time increases language and speech delays in children by 2.64 times compared to no screen time and has statistical significance (p < 0.00001).
***Keywords**: Delay Development, Delay speech, Screen Time*

ABSTRAK
Bahasa merupakan alat komunikasi yang sering digunakan manusia. Di era globalisasi saat ini, sangat mudah untuk mencari dan bertukar informasi. Hal ini tentunya karena kemajuan di era globalisasi, segala sesuatu menjadi semakin mudah karena gadget. Penggunaan gadget yang berlebihan dan tidak terkontrol dapat berdampak buruk pada psikologi dan perkembangan anak, terutama pada kemampuan sosial dan komunikasinya. Tujuan dari penelitian ini adalah untuk mengetahui pengaruh rata-rata screen time terhadap gangguan bahasa dan bicara pada anak. Penelitian ini merupakan penelitian sistematis dan meta-analisis. Artikel yang digunakan dalam penelitian ini diperoleh dari beberapa database antara lain PubMed, Science Direct, dan Google Scholar. Berdasarkan hasil desain studi kasus kontrol menunjukkan bahwa waktu layar meningkatkan keterlambatan bahasa dan bicara pada anak sebesar 2,67 kali lipat dibandingkan tanpa waktu layar dan memiliki signifikansi statistik (p <0,00001). Hasil subkelompok cross-sectional menunjukkan bahwa waktu di depan layar meningkatkan keterlambatan bahasa dan

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bicara pada anak-anak sebesar 2,64 kali lipat dibandingkan tanpa waktu layar dan memiliki signifikansi statistik (p <0,00001).
Keywords: Screen Time, Keterlambatan Bicara, Keterlambatan Bahasa

INTRODUCTION

Language is a message conveyed as a tool of human communication in the form of expression and used in certain conditions (Noermanzah et al, 2019). Language development is something that a child must have at a certain age, apart from that, children must be able to compose simple to complex words at a certain age according to their development (Cristy, 2017). When a child is in the growth period, stimulation is needed, especially in the golden age, namely early childhood, because in the golden period of growth, the child will develop and learn. Fardiah et al in (Suryaningsih Rahmadani and A.E Yon, 2021)

In the current globalisation era, finding and exchanging information is effortless. Because of progress in the era of globalization, everything has become easier because of gadgets. Gadgets are electronic devices that download the latest information from various new technologies that make human life more practical. Gadgets include computers or laptops, tablets or PCs, video games and cell phones (Dewanti *et al.*, 2016). Even though gadgets are a technology in modern times that have many benefits, they can have negative impacts, such as dependence on users, both adults and children (Wijoyono Viona Velika, Negara I nengah Sudika and Aryanto hendro, 2015)

Excessive and uncontrolled use of gadgets can have a negative impact on children's psychology and development, especially on their social and communication skills (Elenovia Chandra Santoso and et al, 2013). The negative effect of screen time is the absence of direct interaction and stimulation between children, family members and their caregivers. This results in reducing their significant role in facilitating more efficient learning. Excessive use of screen time can cause speech delays in children. Speech disorders in children affect a person's voice and word formation so that he is unable to express what he means (Mulyani *et al.*, 2023). Good use of screen time to educate children can support the development of their language, literacy and cognitive aspects.

Therefore, adults need to have a good understanding of the impact of excessive screen time as a child because research has shown that too much exposure can have adverse effects on a child's language use, executive function, quality of play, language

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development, attention, and thought processes in children under five years of age. Excessive screen time can also affect young children's mathematics, language and reading abilities (Ponti et al., 2017). Based on the results of research by (Karani Nf, Sher J and Mophosho M, 2022), it is explained that the increase in children's language and speech disorders occurs due to the duration of screen time and the child's early age, especially in children under two years old. Parents also have an essential role in children's language development.

Although there are some positive benefits, the benefits of screen time on children have more negative impacts. This is the reason that prompted the author to carry out a systematic analysis and meta-analysis that focuses on screen time on language and speech delays in children.

METHOD

Study Desain

This research is a systematic study and meta-analysis. The articles used in this research were obtained from several databases, including PubMed, Science Direct, and Google Scholar. By using the search keywords "Screen time" AND "Language delay" AND "Observational study".

The article search was carried out taking into account the eligibility criteria defined using the PICOS model. The population in this study consisted of children aged 0-7. The intervention was screen time; the comparison was not given screen time, and the outcome was language and speech delay disorders. The study designs included in the meta-analysis synthesis are cohort and cross-sectional.

Inclusion Criteria

The articles included in this research are full-paper articles with observational studies. The intervention provided was screen time, with a comparison without screen time, and the research subjects were children aged 0-7 years. The research outcome is language and speech delay disorders, with articles whose research was conducted throughout the world.

Exclusion Criteria

Articles excluded in this research were articles published in languages other than English and articles published under 2000.

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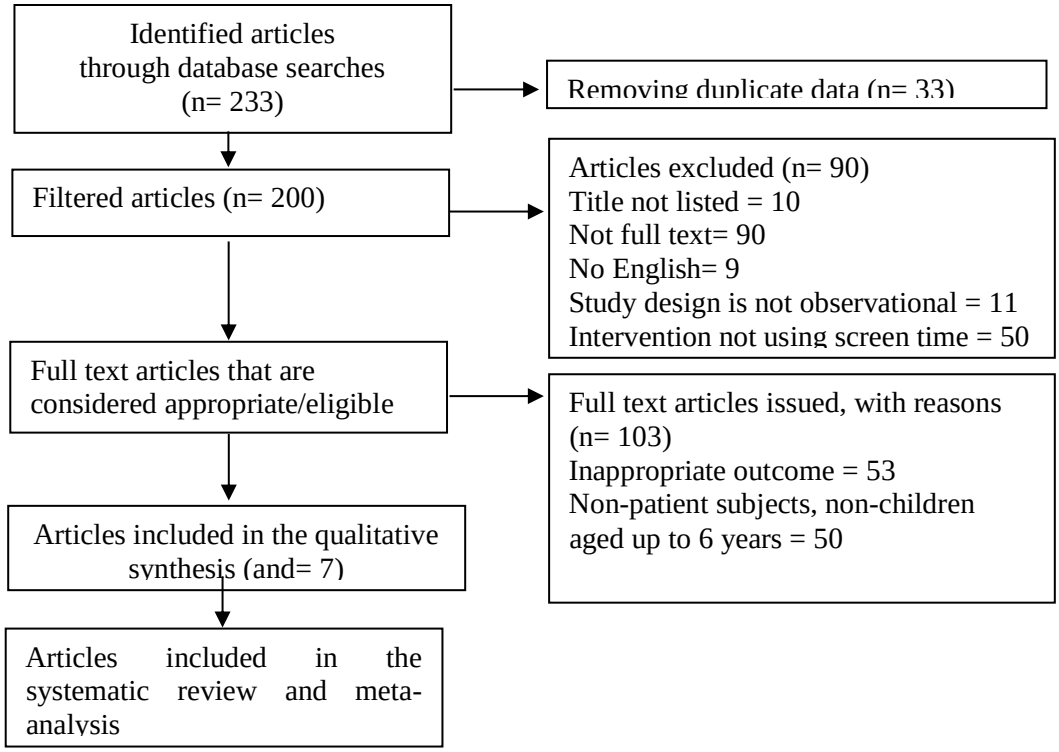
RESULTS AND DISCUSSION (12pt)

The process of searching for articles by searching the database with the PRISMA flow diagram is shown in Figure 1.



Picture 1. PRISMA *flow diagram*

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Table 1. *Critical appraisal checklist for a cross-sectional study*

No	Checklist questions	Publication (Author and Year)				
		Heuvel *et al* (2019)	**Varadarajan S *et al* (2021)**	**Dewi PDR *et al* (2022)**	**Menbere *et al* (2022)**	**Asikainen *et al* (2021)**
1	Does this objective address the research focus/problem?	1	1	1	1	1
2	Is the cross-sectional research method suitable for answering the research question?	1	1	1	1	1
3	Are the research subject selection methods written clearly?	0	1	0	0	1
4	Can the sampling method introduce bias (selection)?	1	0	1	0	0
5	Does the research sample taken represent the designated population?	1	1	1	1	1
6	Is the sample size based on pre-study considerations?	0	0	1	0	0
7	Was a satisfactory response achieved?	1	1	1	1	1
8	Are the research instruments valid and reliable?	1	1	1	1	1
9	Was statistical significance assessed?	1	1	1	1	1
10	Are confidence intervals provided for the primary outcome?	1	1	1	1	1
11	Are there confounding factors that have not been taken into account?	0	1	1	1	1
12	Can the results be applied to your research?	1	1	1	1	1
	Total	9	10	11	9	10

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Table 2. *Critical appraisal checklist case-control study*

No	Checklist questions	Publication (Author and Year)	
		Al Hosani Salwa *et al* (2023)	**Collet M *et al* (2023)**
1	Does the research answer a focused question/problem?	1	1
2	Does the research answer a focused question/problem?	1	1
3	Are there enough subjects (employees, teams, divisions, organizations) in the study to prove that the findings did not occur by chance?	1	1
4	Is case and control selection based on external, objective and validated criteria?	1	0
5	Were the two groups comparable at the start of the study?	1	1
6	Are objective and unbiased outcome criteria used?	1	1
7	Is there data dredging?	1	1
8	Are objective and validated measurement methods used to measure outcomes? If not, were the results assessed by someone unaware of the group assignment (i.e., the assessor in the dark)?	1	1
9	Is effect size practically relevant?	1	1
10	How precise are the impact estimates? Are confidence intervals given?	1	1
11	Could there be confounding factors that have not been taken into account?	0	1
12	Could there be confounding factors that have not been taken into account?	1	1
	Total	11	11

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Table 3. *Summary source*

Author (year)	**Title**	**Country**	**Study Desain**	**Sample**	**P** ***Population***	**I** ***Intervention***	**C** ***Comparison***	**O** ***Outcome***
Hosani *et al.*(2023)	Screen time and speech and language delay in children aged 12–48 months in UAE: a case-control study	Abu Dhabi, UAE	Case-control	227	Children aged 12-28 months	*Screen time*	Non-screen time	Keterlambatan Bahasa dan bicara
Collet M *et al* (2019)	A case-control study found that primary language disorders were associated with screen exposure at 3.5-6.5 years of age.	Prancis	Case-control	167	Children aged 3.5-6.5	*Screen time*	Non screen time	Gangguan keterlambatan Bahasa bahasa
Heuvel *et al* (2019)	Mobile Media Device Use is Associated with Expressive Language Delay in 18-Month-Old Children.	Toronto, Kanada	Crossectional	36	Children aged 24-30 months	*Screen time*	Non-screen time	Gangguan Keterlambatan Komunikasi

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Author (year)	**Title**	**Country**	**Study Desain**	**Sample**	**P** ***Population***	**I** ***Intervention***	**C** ***Comparison***	**O** ***Outcome***
Varadarajan *et al* (2021)	Prevalence of excessive screen time and its association with developmental delay in children aged <5 years: A population-based cross-sectional study in India	India	Crossectional	720	Children under five years old	*Screen time*	Non-screen time	Developmental delay
Dewi Putu DR(2023)	The relationship between screen time and speech delay in 1-2-year-old children	Indonesia	Crossectional	167	Children aged 1-2 years	*Screen time >2 jam*	Screen time < 2 jam	Speech delay
Menbere (2022)	Prevalence and Factors Associated with Isolated Language Delay in under Five Pediatrics Patients who have follow at Neurology Clinic of Saint Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia, 2022: A	Etiopia	Crossectional	269	Children aged 12-59 months	*Screen time*	Non-screen time	Faktor speech dan language delay

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Author (year)	**Title**	**Country**	**Study Desain**	**Sample**	**P** ***Population***	**I** ***Intervention***	**C** ***Comparison***	**O** ***Outcome***
	Cross-Sectional Prospective Study							
Asikainen (2021)	Exposure to electronic media was negatively associated with speech and language development at 18 and 24 months.	Finlandia	Crossectional	997	Children aged 18 and 24 months	*Screen time*	Tidak diberi Screen time	Developmental delay

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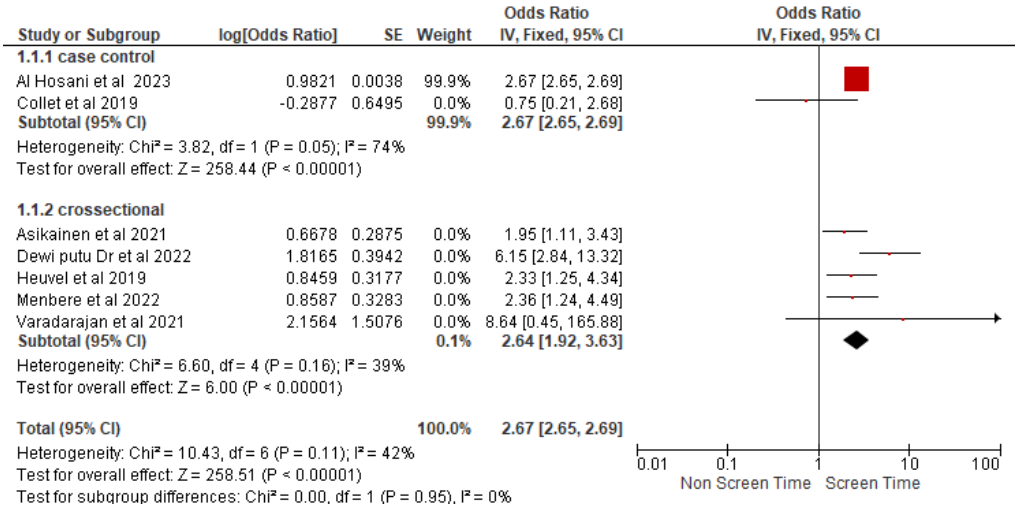
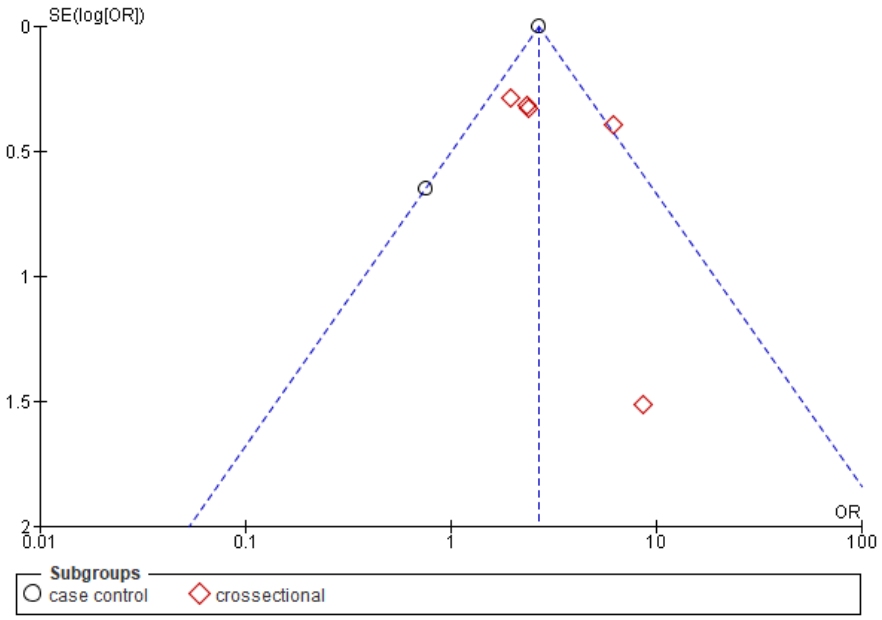


Picture 2. Forest Plot

Based on the results of the forest plot (Figure 2) in the case-control study design subgroup, screen time increases language and speech delays in children by 2.67 times compared to no screen time. It has statistical significance ($p < 0.00001$). The heterogeneity of research data shows I2= 74%, so the data distribution is declared heterogeneous (fixed effect model). The cross-sectional subgroup results show that screen time increases language and speech delays in children by 2.64 times compared to no screen time and has statistical significance ($p < 0.00001$). The heterogeneity of research data shows I2= 39%, so the data distribution is declared heterogeneous (fixed effect model).



Picture 3. The Funnel Plot

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The funnel plot (Figure 3) shows publication bias, characterised by the asymmetry of the right and left plots, where two plots are on the right, and three plots are on the left for cross-sectional study designs. The case-control study design shows publication bias due to asymmetry between the two plots, where 1 plot is on the left side, and 1 plot is in the middle of the line. Case-control graphic plots have a standard error between 1 and 0, and cross-sectional plots have a standard error between 0.5 and 10. Bias also occurs from an imbalance between the distance between studies on both the right and left sides of the funnel plot.

DISCUSSION

Meta-analysis research that has been carried out with seven articles found that screen time increases language and speech delays in children. This is due to excessive use. This follows the research results by (Zimmerman F, Christakis D and Meltzoff A, 2005) discussing the impact of television exposure on children's cognitive development. This study took national data and conducted a longitudinal analysis to understand the relationship between the time children spend in front of the television and their cognitive outcomes. This study found that the more time children spend in front of the television at a young age, the lower their cognitive test results in adolescence. This suggests that excessive television exposure at an early age may have a negative impact on long-term cognitive development. The results of this study indicate that too much time children spend in front of the television can have a negative effect on their mental development.

The study also notes that the type of content children watch can influence the impact. Programs that are designed educationally tend to have a more positive effect than passive entertainment shows. This research shows that parents' interactions with children, especially when watching television, can moderate the negative impact. Interactions such as talking about what you're watching or discussing content can help reduce the adverse effects of excessive screen time. According to (Linebarger Deborah L, 2014), this research found that exposure to screen media in infants and toddlers is generally associated with delays in language development. Children who are exposed to screen media too often and for too long tend to have lower language skills because children spend time in front of the screen passively without human interaction, resulting in a tendency to experience delays in language development.

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This is also in line with research conducted by (Nathanson et al., 2014).

This research indicates that too much television exposure in pre-school children can have a negative impact on their executive function. Executive function is a cognitive skill critical in decision making, planning, and self-control, all related to language and speech development. Another similar study, namely (Madigan S *et al.*, 2019), aims to investigate the relationship between screen time and the results of developmental screening tests in children. This research is necessary because it can provide insight into how screen exposure relates to children's development in early life.

The impact of excessive screen time on children's development. The results indicate that too much time in front of a screen can affect a child's development, including speech. In language and speech development, excessive screen exposure can interfere with the social interactions necessary to develop speech and language skills. The results of this study show that excessive screen time can have a negative impact on children's development, including in terms of speaking ability. Parents can emphasize the importance of wisely limiting screen time, especially for children, to support optimal language and speech development during their growth period. Limiting screen time in children is necessary. In addition to causing language and speech delays in children, other health problems also arise, such as vision and focus (Raheem Amreen *et al.*, 2023). Ways that can be done to overcome Ways to overcome speech development delays in children, namely when their ability to communicate is difficult to understand, is to stimulate them through reading picture stories, introducing symbols through visual media, encouraging discussion and questioning, and encouraging children to tell the activities they are doing or have done.(Azminah, Oktaviani and Citrasukmawati, 2021)

CONCLUSION

The research results show that excessive screen exposure or screen time in children can increase the risk of language and speech development delays. The main factor contributing to this negative impact is excessive use, which leads to minimal interaction between children and their surrounding environment, such as parents, friends and family members. Apart from that, children's focus that is too fixated on the screen can disrupt the development of interactive communication because children tend to remain silent and focus on one point, namely screen time. This can result in

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limitations in children's spoken language development.

It is important to remember that social interaction, verbal stimulation, and interaction with the surrounding environment are important elements in children's language and speech development. Therefore, understanding the negative impact of excessive screen time on children needs to be emphasized to parents and caregivers so they can take wise action in managing their children's screen time. Efforts to limit screen exposure and encourage healthy social and verbal interactions can support optimal language and speech development in children during their developmental years.

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