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Gadget Use and Language Development in Children Aged 4–6 Years: A Multinomial Logistic Regression Study

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ABSTRACT

The rapid development of technology supported by various attractive gadget features is believed to have a relationship with the golden age period in children. The multinomial logistic regression analysis revealed significant associations between gadget use intensity and language development categories. Specifically, higher gadget use was associated with increased odds of children falling into the 'appropriate' and 'questionable' language categories relative to the 'deviation' category, highlighting a complex, non-linear dynamic in digital exposure. This study aims to determine the effect of gadget use on children's language development aged 4-6 years in children. This type of research uses quantitative with descriptive analysis techniques, univariate, and multinomial logistic regression analysis. The study population was children aged 4-6 years in one kindergarten totaling 71 people and selected based on total sampling technique. The research instruments used, namely the Developmental Pre-Screening Questionnaire (KPSP) and the Gadget Use Intensity Scale. The results of this study indicate that the use of gadgets has a significant impact on children's language abilities, with a positive correlation in appropriate and questionable language skills, and a negative correlation in language abilities that show deviations. This research shows that the use of gadgets has a significant impact on the language development of children aged 4-6 years. Therefore, schools are expected to continue providing activities that stimulate children's language development, while parents are expected to monitor gadget usage at home.

***Keywords** : Gadget; Language Development; Children*

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INTRODUCTION

Early childhood development was considered a critical period in human life, particularly in the domain of language development. The so-called *golden age*, spanning from 0 to 6 years, was recognized as a crucial phase during which the child's brain developed rapidly, reaching approximately 80% of adult brain capacity(1). During this period, the foundations of cognitive, motor, linguistic, and social abilities were established. Therefore, this stage was widely regarded as the optimal time to maximize child development, especially in language, which served as a fundamental basis for communication and social interaction in later life.

According to Amalia's research(2), early childhood language ability consisted of two primary aspects: receptive and productive language skills. Receptive language referred to the child's ability to comprehend language through listening and reading, whereas productive language was associated with the ability to express thoughts and feelings through speaking and writing. Both aspects were considered essential to be developed during early childhood, as language functioned as the primary tool for communication and interaction with the surrounding environment.

Children's language ability was not only influenced by biological factors but also by environmental conditions. Environmental stimulation played a significant role in supporting language development. Insufficient or inadequate stimulation could lead to language delays, which might subsequently affect children's cognitive and social abilities(3). A language-rich environment, characterized by intensive verbal interactions between children and adults or peers, was considered crucial for achieving optimal language development.

However, in the digital era, one of the major challenges faced by children was the widespread use of gadgets. Devices offering various engaging features and applications had become an integral part of daily life, including for young children. Exposure to electronic

devices presented unique challenges for early childhood development. Previous studies consistently highlighted the adverse effects of excessive gadget use, such as decreased concentration, limited social interaction, and an increased risk of language delay due to the lack of two-way communication stimulation(4,6). Limited direct interaction with the environment due to excessive screen time could hinder the optimal acquisition of children's productive language skills.

Based on a survey conducted by the Ministry of Health, the prevalence of language delay among children in Indonesia ranged from 5% to 10%(7). This phenomenon became increasingly concerning alongside the rising intensity of gadget use among children. The World Health Organization (WHO) and recent literature emphasized that evaluating screen exposure in early childhood should consider two main metrics: daily duration and frequency of use(8).

Although previous studies had extensively examined the general negative impacts of gadget use, there remained a lack of research that mapped the probability of these effects into specific categories of language development (appropriate, questionable, and deviant) using multinomial logistic regression models. Furthermore, the dynamics of gadget use among early childhood populations in coastal areas with distinctive demographic characteristics and parenting patterns, such as in North Galesong District, had not been widely explored. Therefore, this study aimed to address this gap by conducting an in-depth analysis of the influence of gadget use intensity on the classification of language development among children aged 4–6 years.

Given the critical importance of language development during the golden age and the increasing use of gadgets among early childhood populations, this study aims to analyze the effect of gadget use on language development in children aged 4–6 years. Specifically, this study examines the relationship between gadget use and language development among children aged 4–6 years at TK Reina in North Galesong District, Takalar. It is expected that

the findings of this study will provide valuable insights for parents, educators, and stakeholders in understanding and addressing the impact of technology on early childhood development.

METHOD

This study adopted a quantitative approach to evaluate the effect of gadget use on language development among children aged 4–6 years. The independent variable was gadget use, while the dependent variable was children's language development. Gadget use was measured based on duration and frequency and was categorized into low (<30 minutes per day), moderate (30–60 minutes per day), and high (>60 minutes per day). Language development was assessed using the *Kuesioner Pra Skrining Perkembangan* (KPSP), which encompassed phonemic, semantic, vocabulary, and grammatical aspects.

The study population consisted of students at TK Reina in North Galesong District, Takalar Regency, with a sample of 71 children aged 4–6 years selected using a total sampling technique, in which the entire population was included as the research sample. Data were collected using the KPSP to measure language development and a gadget use intensity scale consisting of 10 items.

The instrument used to measure the independent variable was the Gadget Use Intensity Scale[9]. This scale consisted of 10 items assessing frequency and duration aspects. Based on psychometric testing of the original instrument, the scale demonstrated excellent reliability with a Cronbach's Alpha coefficient of 0.87 and had met normality assumptions, indicating that it was appropriate and valid for use as a data collection instrument in this study.

Data analysis included descriptive analysis to provide an overview of the variables, univariate analysis to describe the characteristics of each variable, and multinomial logistic regression analysis to evaluate the effect of gadget use on children's language development

across three categories. This method was designed to generate quantitative data that could be statistically analyzed, enabling the researchers to understand the relationship between gadget use and language development among early childhood populations at TK Reina.

RESULTS

The distribution of respondents' characteristics includes children's age, gender, parental education (mother and father), parental occupation (mother and father), gadget use in relation to language development, univariate analysis of gadget use, univariate analysis of language development, the frequency of gadget use by age based on KPSP, and multinomial logistic regression analysis of gadget use on language development among children aged 4–6 years at TK Reina.

Table 1. Demographic Characteristics of Respondents

Characteristics	Categories	Frequencies (n)	Percentage (%)
Child's Age	51 - 57 months	10	14,1 %
	58 - 63 months	13	18,3 %
	64 - 68 months	16	22,5 %
	69 - 72 months	32	45,1 %
Child's Gender	Male	40	56,3 %
	Female	31	43,7 %
Mother's Highest Level of Education	No schooling – Primary school	24	33,8 %
	Lower Secondary (SMP) – Upper Secondary (SMA)	36	50,7 %
	Diploma – Bachelor's Degree	11	15,5 %
Father's Highest Level of Education	No schooling – Primary	35	49,3 %
	Lower Secondary (SMP) – Upper Secondary (SMA)	30	42,3 %
	Diploma – Bachelor's Degree	6	8,5 %

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Mother's Occupation	Housewife	66	93,0 %
	Teacher	2	2,8 %
	Self-employed	1	1,4 %
	Civil servant	1	1,4 %
	Private sector employee	1	1,4 %
Father's Occupation	Fisherman	32	45,1 %
	Self-employed	17	23,9 %
	Labourer	8	11,3 %
	Private Sector Employee	4	5,6 %
	Police Officer	3	4,2 %
	Contract Worker	2	2,8 %
	Other	5	7,0 %

Sources: Primary data 2025

Table 1 presents the demographic profile of 71 children aged 4–6 years at TK Reina. The majority of respondents fall within the developmental age range of 69–72 months (45.1%), with a slightly higher proportion of boys (56.3%) compared to girls (43.7%). The family background characteristics indicate a specific sociodemographic profile; most mothers have a junior to senior high school education (50.7%) and primarily serve as homemakers (93.0%). Meanwhile, nearly half of the fathers have an educational level ranging from no formal education to elementary school (49.3%) and predominantly work in the informal maritime sector as fishermen (45.1%). This profile indicates that children's daily caregiving patterns largely depend on the maternal figure at home.

Table 2. Crosstabulation of Gadget Use and Language Development

Gadget Use		**Language Development**			
		Deviations	**Uncertain**	**Appropriate**	**Total**
Low	**Frequencies**	0	1	1	2
	Gadget Use (%)	0,0%	50,0%	50,0%	100,0%
	Language Development (%)	0,0%	3,7%	2,6%	2,8%

	Total	0,0%	1,4%	1,4%	2.8%
Moderate	**Frequencies**	1	5	8	14
	Gadget Use (%)	7,1%	35,7%	57,1%	100,0%
	Language Development (%)	16,7%	18,5%	21,1%	19,7%
	Total	1,4%	7,0%	11,3%	19,7%
High	**Frequencies**	5	21	29	55
	Gadget Use (%)	9,1%	38,2%	52,7%	100,0%
	Language Development (%)	83,3%	77,8%	76,3%	77,5%
	Total	7,0%	29,6%	40,8%	77,5%
	Frequencies	6	27	38	71
	Gadget Use (%)	8,5%	38,0%	53,5%	100,0%
	Language Development (%)	100,0%	100,0%	100,0%	100,0%
	Total	8,5%	38,0%	53,5%	100,0%

Sources: Primary data 2025

Table 2 illustrates the relationship between the intensity of gadget use and language development among children aged 4–6 years. Among children with low gadget use (2 children), none experience language deviation, with 50% categorized as questionable and 50% as appropriate. For moderate gadget use (14 children), 7.1% experience deviation, 35.7% are categorized as questionable, and 57.1% as appropriate. In contrast, among children with high gadget use (55 children), 9.1% experience deviation, 38.2% are categorized as questionable, and 52.7% as appropriate. Overall, the table indicates that the intensity of gadget use is associated with children's language development, where higher levels of gadget use tend to be accompanied by a greater number of children exhibiting questionable or appropriate language development.

Table 3. Frequency of Gadget Use Among Children Aged 4–6 Years (51–72 Months)

	Parameter	Description
Gadget Usage Intensity	Low	2 (2,8 %)
	Moderate	14 (19,7 %)
	High	55 (77,5 %)
Minimum	Duration	1- 30 minutes/day
	Frequency	1 - 3 days/week
	Age at First Use	5 Years – 5 Years 9 Months
Maximum	Duration	>60 Minutes/Day
	Frequency	Every Day
	Age at First Use	3 Years – 3 Years 9 Months
Gadget Use	Type	Handphone
	App	YouTube
	Child's Response	Does Not Turn Around When Called

Sources: Primary data 2025

Table 3 presents gadget use among children aged 4–6 years in the sample, showing three categories of intensity: low (2 children, 2.8%), moderate (14 children, 19.7%), and high (55 children, 77.5%). The duration of gadget use ranges from 1–30 minutes per day for minimal use to more than 60 minutes per day for maximal use, with a daily frequency of use. Children generally begin using gadgets between the ages of 3 years and 3 years 9 months, primarily using smartphones with applications such as YouTube. Children's responses to gadget use often indicate reduced responsiveness, as they frequently do not turn when called.

Table 4. Frequency of Language Development Among Children Aged 4–6 Years

Language Development	Frequency	Percentage (%)
Deviations	6	8,5 %
Doubtful	27	38,0 %
Correct	38	53,5 %
Total	71	100,00 %

Sources: Primary data 2025

Table 4 presents the distribution of language development among children aged 4–6 years, categorized into three groups: deviation, questionable, and appropriate. A total of 6 children (8.5%) experience deviation, 27 children (38.0%) demonstrate questionable language development, and 38 children (53.5%) show appropriate (normal) language development.

Table 5. Frequency of Gadget Use by Age Among Children (51–72 Months)

		Intensity of Gadget Use						Total	
		Low		Moderate		High			
		n	%	n	%	n	%	n	%
Age	51–57 Months	0	0,0	0	0,0	10	100,0	10	100
	58–63 Months	0	0,0	3	23,08	10	76,92	13	100
	64–68 Months	0	0,0	3	18,75	13	81,25	16	100
	69–72 Months	2	6,25	8	25,00	22	68,75	32	100
Total		2		14		55		71	

Sources: Primary data 2025

Table 5 presents the frequency of gadget use among children aged 4–6 years. In the 51–57 months age group, all 10 children (100%) demonstrate high-intensity gadget use. In the 58–63 months group, 3 children (23.08%) demonstrate moderate intensity and 10 children (76.92%) demonstrate high intensity. In the 64–68 months group, 3 children (18.75%) demonstrate moderate intensity and 13 children (81.25%) demonstrate high intensity. In the 69–72 months group, 2 children (6.25%) demonstrate low intensity, 8 children (25%) demonstrate moderate intensity, and 22 children (68.75%) demonstrate high intensity. Overall, among the 71 observed children, 2 children (2.82%) demonstrate low intensity, 14 children (19.72%) demonstrate moderate intensity, and 55 children (77.46%) demonstrate high intensity.

Table 6. Results of Multinomial Logistic Regression Analysis

	B	Sig.	Ket.
Language Proficiency (Good) × Gadget Use	1,758	0,000	Signifikan
Language Proficiency (Doubtful) × Gadget Use	1,435	0,004	Signifikan
Language Proficiency (Poor) × Gadget Use	-1,758	0,000	Signifikan

Sources: Primary data 2025

The results of the multinomial logistic regression analysis (Table 6) indicate a statistically significant effect of gadget use on the categorization of children's language development. By setting the "Deviation" category as the reference category, increased intensity of gadget use significantly increases the odds of children being classified in the "Appropriate" category ($B = 1.758$; $p < 0.05$) as well as in the "Questionable" category ($B = 1.435$; $p < 0.05$).

It is important to emphasize that these positive coefficients do not inherently imply that gadget use provides purely beneficial effects on language development. This phenomenon most likely reflects the acquisition of passive vocabulary (receptive language) obtained through exposure to visual content such as YouTube. However, the relatively high probability of children falling into the "Questionable" category indicates that although vocabulary may increase, the absence of interactive two-way communication during gadget use limits the development of expressive and pragmatic language skills, thereby increasing the risk of developmental delay.

DISCUSSION

This study explores how gadget use influences language development among young children enrolled at TK Reina. The participants consist of boys and girls in proportions that are relatively balanced, reflecting a diverse sample. The educational backgrounds of parents vary, with many having completed schooling at the junior to senior high level. In terms of

occupation, most mothers dedicate their time to managing the household, while fathers are engaged in a range of professions, including work in the fishing sector.

A key observation from this research is the notably high intensity of gadget use among children in early childhood. Most children are exposed to gadgets frequently and for extended periods, indicating that digital devices have become an integral part of their daily routines. Only a small portion of children show moderate engagement, and very few have limited exposure. This pattern aligns with previous findings suggesting that prolonged and regular use of gadgets falls into the category of high intensity(9).

The duration of gadget use varies considerably among children, ranging from brief interactions to extended daily use. Additionally, children begin interacting with gadgets at a relatively young age, suggesting early exposure to digital environments. These patterns highlight how technology has become embedded in children's lives from an early developmental stage, shaping their daily experiences and interactions.

Further analysis using multinomial logistic regression reveals a significant relationship between gadget use and language development. Gadget use is associated with both appropriate and uncertain levels of language ability, indicating that its effects are not entirely uniform. At the same time, a negative association is observed with language abilities that fall into the deviation category. These findings underscore the complex and multifaceted nature of how gadget use relates to language development in early childhood.

These results are supported by the study of Lepičnik-Vodopivec and Samec, which indicates that gadget use influences children's language development. Excessive and unsupervised gadget use can hinder children's ability to socialize and communicate with their surrounding environment(10). This is consistent with the findings reported by Handrianto, as cited in Anggrasari and Rahagia, which highlight the negative effects of electronic device use among children, including reduced concentration and focus during learning processes(11). It is important to note that although the majority of children with

high gadget use demonstrate appropriate language development (52.7%), more than one-third (38.2%) exhibit questionable language development, and nearly 10% experience deviation. This indicates that high levels of gadget use may have adverse effects on language development, with a substantial proportion of children demonstrating suboptimal developmental outcomes.

This study also reveals that the most commonly used gadget is the smartphone, with YouTube as the most frequently accessed application. Children's responses to gadget use fall into the category of "not turning when called," indicating a high level of attentional engagement with their devices. This suggests potential negative effects on social interaction and communication abilities. Soetjiningsih emphasizes that optimal child development depends heavily on consistent and meaningful stimulation, particularly through direct social interaction and communication within the child's environment(12).

Contemporary research continues to support this view, showing that children who experience limited interaction, especially reduced verbal exchanges with caregivers. They tend to exhibit weaker language abilities and slower cognitive growth. Studies indicate that when children spend more time engaged with screens independently, they are exposed to fewer words and reduced reciprocal communication, which are critical for vocabulary expansion and language acquisition(13). This highlights that development is not merely influenced by exposure to stimuli, but by the quality of interactive and responsive experiences that actively involve the child.

Furthermore, excessive gadget use can displace essential developmental activities that naturally foster motor, speech, and language skills. Recent systematic reviews and empirical studies have found that high screen exposure is consistently associated with delays in expressive language, reduced social interaction, and even limitations in motor and socio-emotional development(14,15). When children spend more time with gadgets, opportunities for active play, physical exploration, and meaningful conversation decrease

significantly. As a result, the developmental process becomes less holistic, as children miss critical experiences that integrate movement, communication, and social engagement, all of which are fundamental for balanced early childhood development.

The findings of our study underscore the importance of parental and educator involvement in regulating children's gadget use. Although gadgets may offer educational benefits, their use needs to be supervised and limited to support optimal language development and to prevent potential negative impacts. Early intervention and a balanced approach to technology use can help maximize the benefits of gadgets while minimizing their risks to children's language development.

Overall, the results of this study indicate that high-intensity gadget use has the potential to produce significant adverse effects on children's language abilities. These findings can serve as a foundation for designing strategies and guidelines aimed at optimizing the use of technology to support child development, while maintaining essential social interaction and environmental stimulation for ideal language development. Parents and educators need to exercise supervision and control over children's gadget use to promote optimal language development and prevent potential negative consequences. Expert recommendations, such as limiting the duration of gadget use and ensuring that accessed content is educational, need to be implemented to support children's holistic development.

CONCLUSION

This study explores the influence of gadget use on language development in early childhood and reveals several important insights. It finds that most children are exposed to gadgets with a high level of intensity, reflecting frequent and prolonged use in their daily lives. This pattern of use is shown to have a meaningful impact on language development, where children with greater exposure may display language abilities that appear

appropriate or uncertain, while still carrying a risk of developmental deviation. These findings suggest that the relationship between gadget use and language outcomes is complex and cannot be viewed in a strictly positive or negative light.

In this context, the involvement of parents and educators becomes essential in guiding and supervising children's interaction with digital devices. Their role is critical in ensuring that gadget use remains balanced and does not replace important developmental experiences. The study also highlights that children are introduced to gadgets at a relatively early age, which underscores the importance of establishing appropriate boundaries and guidance from the beginning. Early regulation is therefore necessary to support healthier developmental trajectories and to ensure that children continue to benefit from rich social, communicative, and interactive experiences.

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