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The Effect of Gadget Use on Social Interaction Among Preschool Children in XYZ Sub-District, Surabaya

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Abstract

This research examines the impact of gadget use on early childhood social interaction within the urban setting of XYZ Village, Surabaya, amid the growing prevalence of digital exposure among young children. Anchored in Vygotsky's Sociocultural Theory and the Socialisation Theory, the study evaluates how the duration and frequency of gadget use influence key social competencies, including verbal communication, cooperative behavior, and empathy in children aged 3 to 6 years. Employing a quantitative, cross-sectional design, the study collected data from 100 children using parent-administered questionnaires and direct observational methods, followed by analysis through multiple linear regression. The findings demonstrate that both the duration and frequency of gadget use exert a statistically significant influence on children's social interaction ($p < 0.05$), accounting for 19% of the variance ($R^2 = 0.190$). The remaining variation is likely influenced by external variables such as parenting styles, digital content quality, and psychological factors. These outcomes underscore the importance of regulated gadget use, active parental involvement, and integrative educational practices that promote both digital literacy and interpersonal development.

Abstrak

Penelitian ini mengkaji dampak penggunaan gadget terhadap interaksi sosial pada anak usia dini di lingkungan perkotaan kelurahan XYZ, Surabaya, di tengah meningkatnya paparan digital di kalangan anak-anak. Berlandaskan Teori Sosiobudaya Vygotsky dan Teori Sosialisasi, studi ini mengevaluasi bagaimana durasi dan frekuensi penggunaan gadget memengaruhi kompetensi sosial kunci, termasuk komunikasi verbal, perilaku kooperatif, dan empati pada anak usia 3 hingga 6 tahun. Menggunakan desain kuantitatif dan cross-sectional, penelitian ini mengumpulkan data dari 100 anak melalui kuesioner yang diisi oleh orang tua dan metode observasi langsung, diikuti dengan analisis menggunakan regresi linier berganda. Hasil penelitian menunjukkan bahwa baik durasi maupun frekuensi penggunaan gadget memiliki pengaruh yang signifikan secara statistik terhadap interaksi sosial anak-anak ($p < 0.05$), menjelaskan 19% varians ($R^2 = 0.190$). Varians yang tersisa kemungkinan dipengaruhi oleh variabel eksternal seperti gaya pengasuhan, kualitas konten digital, dan faktor psikologis. Temuan ini menyoroti pentingnya penggunaan gadget yang teratur, keterlibatan orang tua yang aktif, dan praktik pendidikan terintegrasi yang mendorong literasi digital dan perkembangan interpersonal.

Kata Kunci : Pendidikan Digital, Masa Kanak-Kanak, Penggunaan Gadget, Regresi Linier Berganda, Interaksi Sosial

INTRODUCTION

The advancement of digital technology has profoundly influenced various aspects of daily life, particularly the interaction patterns of early childhood. Implementing the appropriate technology will definitely have a very positive effect (JudiJanto et al., 2023). Devices such as smartphones and tablets have become integral to children's routines, including those at the preschool level. While these gadgets offer valuable opportunities for accessing information and educational entertainment, their excessive or unregulated use poses potential risks to the

socialisation processes of young children. Empirical studies have demonstrated that, when utilized appropriately, gadgets can enhance cognitive development and support educational engagement. Shafa et al. (2025) underscore the role of gadgets as effective educational instruments that improve information access and learning participation. In a similar vein, Hidayat et al. (2025) highlight the capacity of gadgets to convey moral and religious values when usage is properly supervised. Nevertheless, these advantages may be compromised if gadget usage is not adequately controlled, as overexposure can foster dependency and impede both social interaction and emotional maturation (Shafa et al., 2025).

A growing body of evidence indicates that excessive use of digital devices is linked to numerous adverse effects on children's social development. Sihotang et al. (2021) assert that an overreliance on gadgets may contribute to increased introversion, disturbances in sleep patterns, and a reduction in creative abilities among children. Furthermore, Hidayat and Alvina (2024) highlight that unrestricted access to and interaction with gadgets can foster antisocial tendencies and diminish the development of essential communication skills during childhood.

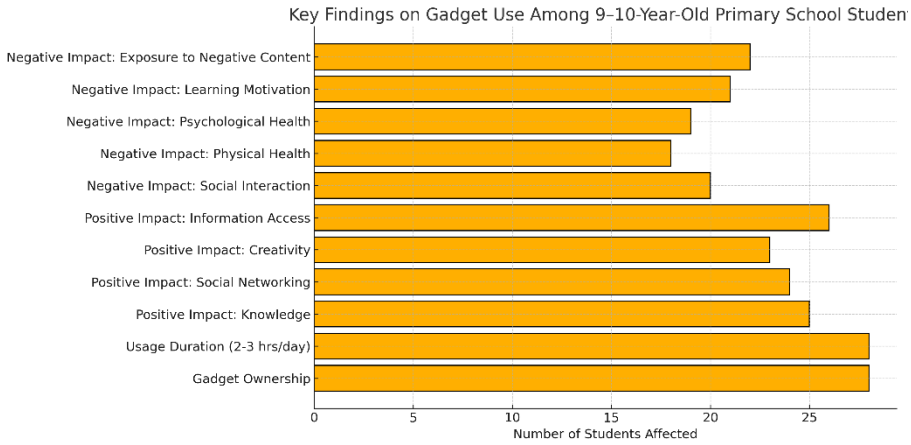

Figure 1. Graph of Main Findings on Gadget Use by 9-10 Year Old Elementary School Students

Based on the data presented in the graph, this study involved a socialisation initiative conducted at SDN 020 Tarakan, aimed at enhancing students' understanding of both the positive and negative impacts of gadget use. The target participants were students from class 4A, approximately 9 to 10 years of age. The findings reveal that the majority of students already possess personal gadgets and operate them independently as part of their daily routines. On average, students reported using gadgets for two to three hours per day, primarily engaging in activities such as texting, making phone calls, browsing the internet, playing games, and downloading various forms of digital content.

When utilized appropriately, digital devices can offer several advantages, including enhanced knowledge acquisition, the expansion of social networks, the stimulation of creativity, and improved access to information and communication. Nevertheless, the use of gadgets also presents inherent risks that warrant careful consideration. Excessive usage has been shown to diminish the quality of children's social interactions, often manifesting in increased withdrawal, individualistic tendencies, and reduced empathy. In addition, prolonged use may lead to adverse physical health outcomes, particularly affecting the eyes and hands. From a psychological perspective, children who engage in excessive screen time face an elevated risk of experiencing sleep disturbances, stress, anxiety, social withdrawal, and, in some cases, aggressive behavior. Furthermore, a growing dependence on digital entertainment content may contribute to a decline in both interest in learning and academic motivation (Hidayat et al., 2024).

Moreover, in the absence of adequate parental supervision, children face an increased risk of exposure to inappropriate digital content, which may adversely influence their character formation and overall social behavior. This issue is particularly salient in urban environments

such as sub-district XYZ, Surabaya, where the proliferation of digital technology continues to rise, even as traditional values of social interaction remain deeply embedded within the community.

Advances in communication have had a significant impact on overall development (Abdillah et al., 2024). Social interaction constitutes a critical component of early childhood development, encompassing competencies such as verbal communication, peer relationship formation, cooperative behavior, and the expression of empathy. According to Socialisation Theory the process of social learning is significantly shaped by environmental factors and social networks, particularly those involving family members and peers. However, the increasing prevalence of gadget use has the potential to displace time otherwise spent in direct social interaction, thereby impeding children's social development (Wang et al., 2024). Furthermore, Vygotsky's Social Development Theory underscores the fundamental role of social interaction and language as mediating tools in children's cognitive development. Consequently, diminished opportunities for face-to-face interaction due to gadget use may adversely affect children's progression within the zone of proximal development (Luong, 2022).

Current research reveals a scarcity of contextual and community-specific investigations that critically assess the impact of gadget use on the social interactions of young children, particularly within urban settings such as sub-district XYZ, Surabaya (Ivana et al., 2021). In this locality, exposure to digital technology is rapidly increasing, while the surrounding social environment continues to be deeply rooted in traditional cultural values.

Therefore, it is essential to conduct a focused examination of how various dimensions of gadget use including duration, frequency, content type, and the degree of parental involvement affect the social interactions of early childhood within a distinct local context such as sub-district XYZ. By integrating the contextual nuances of local cultural values and urban dynamics, this study aims to provide a more comprehensive understanding of the influence of digitalisation on early childhood social development.

This study targets early childhood individuals aged 3 to 6 years residing in the XYZ sub-district, Surabaya, as the primary population. The research primarily investigates the independent variable of gadget use, which is assessed through multiple dimensions, including duration of use, frequency of usage, types of content accessed, and the extent of parental supervision during digital device usage. Concurrently, the study examines the dependent variable of social interaction in young children, encompassing key aspects such as verbal communication, peer interaction, cooperative abilities, and the capacity for empathy toward others.

This study employed a quantitative research approach, utilizing instruments such as questionnaires, direct observations, and interviews with parents and teachers. The research was conducted within the context of the home and urban community environment, capturing the typical social dynamics characteristic of urban settings. Temporally, the study adopted a cross-sectional design, wherein data were collected at a single point in time. Nonetheless, the study presents certain limitations. Specifically, the findings may not be generalizable to rural areas or contexts with markedly different socio-economic conditions. Moreover, the reliance on parental reports and the constraints of limited observational opportunities present challenges in comprehensively capturing children's behavioral patterns.

This study adopts socialisation theory as its foundational framework, incorporating key constructs such as social capital, social networks, and peer influence. Social capital defined as the resources accessible through interpersonal relationships plays a pivotal role in shaping individual behavioural outcomes. Empirical evidence suggests that individuals embedded within robust social networks are more inclined to adopt positive health-related behaviours, including regular physical activity and adherence to nutritional guidelines, as a result of encouragement and support from their peers (Wang et al., 2024). For instance, Li et al. (2023) illustrate how social dynamics within online environments significantly influence participation behaviours, underscoring the applicability of socialisation theory in digital contexts. Furthermore, the concept of social identity, as elaborated by Agyeiwaah et al. (2020), demonstrates that individuals who strongly identify with a social group are more likely to engage in prosocial behaviours consistent with the group's norms, thereby reinforcing the role of socialisation in behavioural formation.

The Sociocultural Theory of Development, originally introduced by Lev Vygotsky, posits that cognitive processes are fundamentally social in nature, shaped by cultural contexts and mediated through language and other symbolic tools. This theoretical framework highlights the central role of social interaction and cultural artefacts in shaping individual learning and development within specific social environments. Vygotsky differentiated between 'actual development' what a child can achieve independently and the 'Zone of Proximal Development' (ZPD), which encompasses tasks a child can accomplish with guided support but not yet autonomously. This emphasis on social mediation underscores that learning is not solely an individual endeavor but is deeply embedded in broader sociocultural structures (Luong, 2022).

Symbolic interactionism represents a foundational theoretical perspective in sociology that underscores the significance of social interaction and the meanings individuals attribute to objects and events in everyday life. Originating primarily from the contributions of George Herbert Mead and Herbert Blumer, this approach asserts that human behaviour is shaped through social interactions and the subjective interpretations individuals construct from those experiences (Carter & Fuller, 2016). In contrast to structuralist perspectives that emphasize macro-level social structures, symbolic interactionism employs a micro-level analytical framework, aiming to understand individual behaviour and meaning-making processes through patterns of communication and interpersonal interaction.

Numerous studies have demonstrated that specific digital interventions can positively influence children's literacy development, particularly when implemented in environments that actively promote literacy engagement. Anggraeni and Listiana (2023) highlight that technology-enriched settings such as digital storytelling and reading activities enhance vocabulary acquisition and reading comprehension among young learners. Similarly, Coppola et al. (2021) underscore the value of shared digital experiences between parents and children, noting that co-viewing educational content significantly reinforces literacy skills. Operto et al. (2020) further assert that active engagement with digital content plays a vital role in fostering language development. Nonetheless, excessive use of digital devices may hinder direct social interaction, which is fundamental for language acquisition. Gomes et al. (2024) found a strong correlation between frequent use of gadgets by both children and their parents and a decline in peer interaction, leading to reduced exposure to verbal stimuli essential for language growth. In line with this, Huang (2023) cautions that although digital technology presents educational advantages, overdependence on gadgets may diminish the quality of face-to-face communication that is crucial for comprehensive language development. Based on these findings, the first hypothesis is proposed as follows:

H1: The use of gadgets has a significant impact on the verbal communication skills of early childhood.

The rising prevalence of gadget use among children has notably affected their socialisation processes and ability to cooperate with peers. Setiani (2020) identified a direct correlation between excessive gadget usage and a decline in social interaction, which may result in increased introversion and challenges in building interpersonal relationships. During the COVID-19 pandemic, Febriani and Pandin (2021) observed that children's reliance on gadgets for both entertainment and education further restricted peer interaction, fostering social isolation rather than collaborative behaviour. Siregar and Yaswinda (2022) further argued that prioritising gadget use disrupts cognitive and emotional development, impairing children's capacity to engage in conversation and cooperative play. Supporting this view, Cahyani et al. (2021) found that gadget dependence impedes the socialisation process by limiting opportunities for direct peer interaction. In light of this evidence, the second hypothesis is proposed as follows:

H2: Gadget use has a significant impact on children's ability to cooperate with their peers.

Increasing concern regarding children's dependence on digital devices has been associated with a marked decline in their empathetic capacities during everyday social interactions. Empirical evidence suggests that excessive gadget use adversely affects both social and emotional development by promoting self-isolating behaviours and diminishing opportunities for face-to-face communication. Siregar and Yaswinda (2022) emphasize that such negative effects are

reflected in children's limited social competencies and emotional constraints, both of which are fundamental for the development of empathy. In a similar vein, Wahyuni et al. (2021) investigated the disparities in socialisation skills between children with gadget addiction and those without, revealing that children who heavily depend on gadgets tend to prefer solitary play and exhibit minimal interest in outdoor activities. This behavioural pattern results in reduced social engagement, which is vital for nurturing empathetic understanding. Based on this synthesis, the third hypothesis is proposed as follows:

H3: Children who use gadgets more frequently demonstrate lower levels of empathy in daily social interactions.

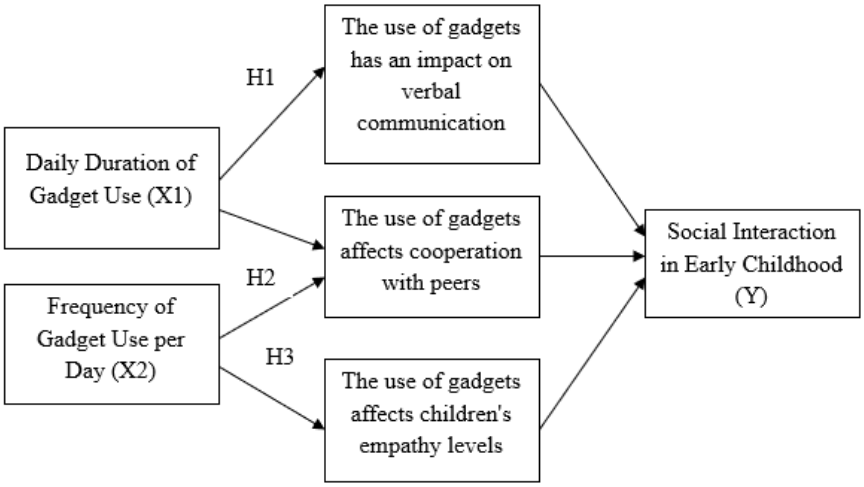

Figure 2. Hypothesis flow chart

METHOD

This study employed a quantitative, cross-sectional design to examine the influence of gadget use including duration, frequency, content type, and parental supervision on the social interaction of early childhood children aged 3 to 6 years in sub-district XYZ, Surabaya. A non purposive sampling method was used to select 100 children who regularly used gadgets, with data collected through parent-completed questionnaires and direct observation. The instrument, validated by early childhood education experts, measured both gadget usage and social interaction dimensions (verbal communication, cooperation, and empathy) using a 5-point Likert scale, and demonstrated acceptable reliability with Cronbach's Alpha ≥ 0.5 . Data collection followed ethical protocols and was analyzed using SPSS version 26 through descriptive statistics, reliability and normality tests, Pearson correlation, and multiple regression analysis. Hypotheses were tested using p-values and regression coefficients, with results interpreted through the lens of Socialisation Theory and Vygotsky's Social Development Theory, providing insights into the digital era's impact on early childhood social development (Luong, 2022; Wang et al., 2024).

RESULTS AND DISCUSSION

Recent years have witnessed growing scholarly interest in the effects of gadget use on social interaction during early childhood. A key area of concern involves the association between prolonged screen exposure and the development of children's social competencies. A longitudinal study conducted by Gath et al. (2025) revealed that children who engage in more than 2.5 hours of screen time daily are significantly more likely to encounter difficulties in peer relationships as they age, underscoring the detrimental effects of excessive screen use on social development. Building upon these findings, the present study aims to examine and present empirical data on the influence of gadget use on the social interaction of young children residing in the XYZ sub-district of Surabaya.

Validity Test

Validity testing pertains to the degree to which an instrument or scale accurately captures the construct it is intended to measure. Rather than being a singular property quantifiable by a single statistic, validity represents a comprehensive body of empirical evidence that supports the theoretical and practical justification for interpreting the results derived from the instrument (Pallant, 2016).

Table 1. Validity Test of Daily duration of gadget use (X1)

No.	R Count	R Table	Description
1	0.337	0.1966	Valid
2	0.415	0.1966	Valid
3	0.427	0.1966	Valid
4	0.459	0.1966	Valid
5	0.426	0.1966	Valid

Table 2. Validity Test of Frequency of gadget use per day (X2)

No.	R Count	R Table	Description
1	0.504	0.1966	Valid
2	0.493	0.1966	Valid
3	0.473	0.1966	Valid
4	0.416	0.1966	Valid
5	0.312	0.1966	Valid

Table 3. Validity Test of Social interaction of early childhood (Y)

No.	R Count	R Table	Description
1	0.496	0.1966	Valid
2	0.471	0.1966	Valid
3	0.463	0.1966	Valid
4	0.451	0.1966	Valid
5	0.421	0.1966	Valid

The validity test for the variable Daily Duration of Gadget Use (X1) was carried out by comparing each item's calculated correlation coefficient (r count) with the critical value from the r table, which is 0.1966. The analysis revealed that all five items had r count values exceeding the threshold, ranging from 0.337 to 0.459. This outcome confirms that each item in variable X1 is valid and effectively measures the intended construct.

Similarly, the validity assessment for the variable Frequency of Gadget Use per Day (X2) demonstrated that all five items yielded r count values greater than 0.1966, with a range between 0.312 and 0.504. These results indicate that all items in construct X2 are valid.

For the dependent variable Social Interaction of Young Children (Y), the findings also support validity across all items, with r count values ranging from 0.421 to 0.496, each surpassing the critical value of 0.1966.

In conclusion, all items across the three variables (X1, X2, and Y) fulfilled the validity criteria, as their item-total correlation coefficients exceeded the minimum threshold of 0.1966 (with N = 121 and a 5% significance level). Therefore, the instrument used in this study demonstrates satisfactory construct validity and is deemed appropriate for measuring the specified research variables.

Reliability Test

Reliability testing assesses the degree to which a measurement instrument or scale remains free from random errors and consistently captures the intended construct or attribute. According to Julie Pallant in the *SPSS Survival Manual*, reliability serves as an indicator of both the stability and internal consistency of an instrument employed in quantitative research settings. Reliability can be assessed through various methods, one of which is internal consistency. This approach evaluates the degree to which the items within a scale are interrelated and collectively measure a single underlying construct.

The most widely employed indicator for assessing internal consistency is Cronbach's Alpha coefficient, which is typically computed using statistical software such as SPSS. The value of Cronbach's Alpha ranges from 0 to 1, with higher values indicating greater reliability. According to Nunnally (1978), a minimum threshold of 0.70 is generally considered indicative of acceptable reliability. However, for scales comprising fewer than ten items, Cronbach's Alpha values are often lower; in such cases, it is advisable to also report the mean inter-item correlation, which is ideally expected to fall between 0.20 and 0.40 (Briggs & Cheek, 1986).

Table 4. Reliability Test

Variable	Cronbach Alpha	R table	Description
Daily duration of gadget use (X1)	0.548	0.60	Realiable
Frequency of gadget use per day (X2)	0.591	0.60	Realiable
Social interaction of early childhood (Y)	0.617	0.60	Realiable

The construct of Daily Duration of Gadget Use (X1) yielded a Cronbach's Alpha value of 0.548. Although this value falls slightly below the commonly accepted threshold of 0.60, as proposed by Nunnally (1978), the dataset categorizes it as 'Reliable'. This suggests that the construct demonstrates an acceptable level of internal consistency, particularly suitable for exploratory studies or in cases where the scale comprises a limited number of items.

Similarly, the variable Frequency of Gadget Use per Day (X2) produced a Cronbach's Alpha value of 0.591. While this value does not formally surpass the standard threshold, it remains close enough to indicate an almost satisfactory degree of internal consistency. Therefore, this instrument may be considered sufficiently reliable for use in preliminary investigations.

In contrast, the variable Social Interaction of Early Childhood (Y) reported a Cronbach's Alpha of 0.617, exceeding the minimum acceptable value of 0.60. This result confirms that the items within this construct possess adequate internal consistency for measuring dimensions of early childhood social interaction.

In summary, the reliability analysis indicates that all three variables exhibit acceptable levels of internal consistency, with two variables (X1 and X2) marginally below the ideal threshold but still deemed reliable within the context of the study. The construct Y clearly satisfies the established criteria. Hence, the research instrument as a whole is appropriate for continued use, particularly in exploratory or initial research settings.

Classic Assumption Test

Normality Test

Normality testing is a statistical method employed to determine whether the distribution of data within a variable closely approximates a normal distribution. According to Julie Pallant in the *SPSS Survival Manual*, this test plays a critical role in data analysis, as many parametric

statistical techniques such as linear regression, ANOVA, and t-tests require the assumption that the underlying data follow a normal distribution.

Pallant outlines two principal approaches to evaluating normality. The first is visual inspection, which involves interpreting graphical representations such as histograms, normal Q-Q plots, and boxplots. A histogram that exhibits a bell-shaped curve and Q-Q plot points that align with the diagonal reference line suggest that the data follow a normal distribution (Pallant, 2016).

The second approach involves formal statistical testing. The Kolmogorov-Smirnov and Shapiro-Wilk tests are commonly used in SPSS for this purpose, with the latter being particularly suitable for small to medium sample sizes. In both tests, the null hypothesis asserts that the data are normally distributed. If the resulting significance value (p-value) exceeds 0.05, the null hypothesis is not rejected, indicating that the data do not significantly deviate from a normal distribution.

Table 5. Normality Test

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Daily duration of gadget use (X1)	,111	100	,004	,978	100	,101
Frequency of gadget use per day (X2)	,103	100	,010	,976	100	,069
Social interaction of early childhood (Y)	,082	100	,090	,984	100	,284
a. Lilliefors Significance Correction						

The normality test for the variable Daily Duration of Gadget Use (X1) produced a significance value of 0.004 for the Kolmogorov-Smirnov test ($p < 0.05$), indicating that the data deviate from a normal distribution. However, the Shapiro-Wilk test yielded a significance value of 0.101 ($p > 0.05$), suggesting that the data do not significantly differ from a normal distribution. Given that the Shapiro-Wilk test is recommended for small to medium sample sizes ($N < 200$), the data for X1 can be considered to meet the assumption of normality.

Similarly, the Frequency of Gadget Use per Day (X2) showed a significance value of 0.010 ($p < 0.05$) in the Kolmogorov-Smirnov test, indicating a deviation from normality. In contrast, the Shapiro-Wilk test reported a significance value of 0.069 ($p > 0.05$), implying that the distribution does not significantly differ from normal. Therefore, the data for X2 are deemed to satisfy the normality assumption.

For the variable Social Interaction of Young Children (Y), both the Kolmogorov-Smirnov and Shapiro-Wilk tests produced significance values above 0.05, specifically 0.090 and 0.284, respectively. These results indicate that the data are normally distributed according to both statistical tests. In conclusion, based on the Shapiro-Wilk test—which is more appropriate for the sample size used all three variables exhibit distributions that do not significantly differ from normal. Consequently, the data fulfill the normality assumption and are appropriate for further analysis using parametric statistical methods, such as linear regression.

Heteroscedasticity Test

The heteroscedasticity test is a methodological procedure in regression analysis designed to determine whether the variance of residuals (prediction errors) remains constant across the full range of predictor values. According to Julie Pallant in the *SPSS Survival Manual*, heteroscedasticity constitutes a violation of a fundamental assumption in classical linear regression homoscedasticity which requires the residuals to exhibit constant (homogeneous) variance for all values of the independent variable (Pallant, 2016).

When heteroscedasticity is present, the variance of the residuals changes across different levels of the independent variable. This condition results in inefficient estimates of regression coefficients and undermines the validity of inferential statistical tests, such as the t-test and F-test, although the regression parameters themselves remain unbiased.

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,043	1,469		2,071	,041
	Daily duration of gadget use (X1)	-,033	,066	-,051	-,493	,623
	Frequency of gadget use per day (X2)	-,001	,062	-,001	-,008	,993
a. Dependent Variable: Abs_Res						

Table 6. Heteroscedasticity Test

The heteroscedasticity test was carried out by performing a regression analysis using the absolute residual values (Abs_Res) as the dependent variable. This test aimed to identify whether the regression model exhibited any inconsistency in the variance of residuals, which would indicate the presence of heteroscedasticity.

The results presented in the coefficients table reveal significance values of 0.623 for Daily Duration of Gadget Use (X1) and 0.993 for Frequency of Gadget Use per Day (X2). Since both values exceed the 0.05 threshold, there is no statistically significant relationship between the independent variables and the absolute residuals. This outcome indicates the absence of heteroscedasticity within the regression model.

In conclusion, the findings confirm that the regression model adheres to the assumption of homoscedasticity, demonstrating that the variance of residuals remains constant across all levels of the predictor variables. As a result, the regression coefficients and the associated inferential statistics can be regarded as valid and reliable.

Multicollinearity Test

Multicollinearity testing is an essential procedure in multiple linear regression analysis aimed at identifying the presence of high correlations among independent variables within a model. In the *SPSS Survival Manual*, Julie Pallant defines multicollinearity as a condition where two or more predictor variables exhibit strong interrelationships, thereby complicating the estimation of each variable's unique effect on the dependent variable (Pallant, 2016).

The presence of high multicollinearity may lead to unstable estimates of regression coefficients and inflated standard errors, which in turn diminish the model's predictive accuracy and compromise the validity of statistical inferences.

To detect multicollinearity in SPSS, Pallant recommends examining two key indicators. The first is the Tolerance value, which reflects the proportion of variance in an independent variable not explained by other predictors. A tolerance value below 0.10 signals a high degree of multicollinearity. The second measure is the Variance Inflation Factor (VIF), calculated as the inverse of tolerance (VIF = 1/Tolerance). A VIF exceeding 10.0 suggests severe multicollinearity, although some scholars advocate a more conservative threshold of 5.0.

Table 7. Multicollinearity Test

Coefficients[a]							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	14,708	2,505		5,871	,000		
Daily duration of gadget use (X1)	,018	,113	,016	,157	,875	,963	1,039
Frequency of gadget use per day (X2)	-,015	,106	-,014	-,139	,889	,963	1,039
a. Dependent Variable: Social interaction of early childhood (Y)							

The results of the multicollinearity test indicate that the analysis was conducted to verify the absence of high correlations between the independent variables within the multiple regression model. The independent variables examined included X1 (Daily Duration of Gadget Use) and X2 (Frequency of Gadget Use per Day). Both variables yielded a Tolerance value of 0.963 and a Variance Inflation Factor (VIF) of 1.039.

These findings suggest that the Tolerance values, which are close to 1 and well above the commonly accepted minimum threshold of 0.10, reflect a very low degree of collinearity between the independent variables. Similarly, the VIF values, being close to 1 and far below the standard cut-off values of 5.0 or 10.0, confirm that the regression model does not exhibit signs of serious multicollinearity.

In conclusion, the Tolerance and VIF values demonstrate that the independent variables in the regression model are free from multicollinearity. Therefore, the model satisfies the multicollinearity assumption, allowing for valid and independent interpretation of the regression coefficients without overlapping influences among predictors.

Hypothesis Testing

Determination Coefficient Test

In *SPSS Survival Manual* by Julie Pallant, the coefficient of determination (R Square) is described as a statistical measure used in regression analysis to indicate the proportion of variability in the dependent variable that can be accounted for by the independent variables included in the model. Represented by R^2, this coefficient ranges in value from 0 to 1. An R^2 value of 0 implies that the model fails to explain any variation in the dependent variable, whereas an R^2 value of 1 indicates that the model accounts for all observed variation.

Pallant highlights that R^2 serves as an indicator of the strength of association between the regression model and the dependent variable (Pallant, 2016). A higher R^2 value signifies a greater proportion of variance in the outcome that can be attributed to the predictors. Nevertheless, she cautions that R^2 alone does not confirm statistical significance; therefore, it must be interpreted alongside additional statistical outputs such as the ANOVA table and corresponding significance levels. Furthermore, Pallant addresses the importance of the Adjusted R Square, particularly in models involving multiple independent variables. Adjusted R^2 refines the original R^2 value by considering the number of predictors and the sample size, offering a more accurate assessment of the model's generalizability to the broader population.

Table 8. Determination Coefficient Test

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,436[a]	,190	,173	2,912
a. Predictors: (Constant), Daily duration of gadget use (X1) Frequency of gadget use per day (X2)				

The coefficient of determination test represents a critical component of regression analysis, serving to quantify the proportion of variance in the dependent variable (Y) that can be accounted for by the independent variables (X). In this context, the test was employed to evaluate the extent to which Daily Duration of Gadget Use (X1) and Frequency of Gadget Use per Day (X2) explain variations in Early Childhood Social Interaction (Y).

According to the SPSS output in the Model Summary section, the results indicate the following values: R = 0.436, R Square = 0.190, and Adjusted R Square = 0.173. The R Square value of 0.190 suggests that approximately 19% of the variability in early childhood social interaction is explained by the two independent variables gadget use duration and frequency. The remaining 81% of the variance is attributable to factors not included in the current model.

The Adjusted R Square value, slightly lower at 0.173, accounts for the number of predictors and the sample size, thereby offering a more conservative and accurate estimate of the model's explanatory power.

In conclusion, the coefficient of determination test demonstrates that the regression model possesses a modest capacity to explain the influence of gadget use on children's social interaction. While both predictors contribute significantly, additional variables should be considered to comprehensively understand the broader dynamics of early childhood social behavior in the digital age.

Multiple Linear Regression Test

Julie Pallant, in her *SPSS Survival Manual*, describes multiple linear regression as a statistical method used to predict the value of a dependent variable based on two or more independent variables, allowing researchers to assess each predictor's unique contribution while controlling for others. This technique is especially useful in social and psychological research to model relationships between multiple predictors and continuous outcomes, such as stress or academic performance. Key components include R Square and Adjusted R Square, which measure the explanatory power and generalizability of the model, and the Coefficients Table, which details each predictor's statistical influence. Pallant also emphasizes the importance of verifying assumptions such as normality, linearity, multicollinearity, and homoscedasticity to ensure the validity of the results, positioning multiple linear regression as both a powerful predictive tool and an analytical framework for understanding variable relationships (Pallant, 2016).

Table 9. Multiple Linear Regression Test

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10,708	2,115		5,097	,000
	Daily duration of gadget use (X1)	,325	,107	,312	3,037	,003
	Frequency of gadget use per day (X2)	,284	,099	,298	2,896	,005
a. Dependent Variable: Social interaction of early childhood (Y)						

$Y = a + b_1X_1 + b_2X_2 + ...+bnXn$

Description :

Y : Social Interaction in Early Childhood

A : Constant (Fixed value)

b_1,b_2 : Regression coefficient (Estimated value)

X_1 : Daily duration of gadget use

X_2 : Frequency of gadget use per day

Multiple linear regression constitutes a statistical technique employed to evaluate the concurrent influence of two or more independent variables on a single dependent variable measured on a continuous scale. In the document provided, this regression model is applied to assess the extent to which daily gadget usage duration (X1) and frequency of gadget use per day (X2) affect social interaction among young children (Y).

1. The regression equation derived from the analysis is:

   Y = 10.708 + 0.325X1 + 0.284X2

   This equation indicates that each one-unit increase in the duration of gadget use (X1) and frequency of daily usage (X2) corresponds to an increase of 0.325 and 0.284 points, respectively, in the social interaction score, assuming other variables remain constant.

2. The regression analysis was conducted by evaluating the unstandardised coefficient values (B), significance levels (Sig.), as well as t-tests (for partial effects) and F-tests (for simultaneous effects).

   a) The significance values for X1 and X2 are 0.003 and 0.005, respectively, both of which are below the threshold of 0.05. These results demonstrate that both independent variables exert statistically significant partial effects on the dependent variable.
   b) The F-test resulted in a significance value of 0.000, confirming that X1 and X2 simultaneously influence Y to a statistically significant degree.

In conclusion, the multiple linear regression test in this analysis reveals that both independent variables significantly impact the dependent variable, both individually and jointly. This finding suggests that the pattern of gadget use among young children can serve, to some extent, as a predictor of their level of social interaction.

F-test (Simultaneous)

In the *SPSS Survival Manual*, Julie Pallant describes the F-test (Simultaneous) in multiple linear regression as a statistical procedure designed to evaluate the overall significance of the regression model (Pallant, 2016). Specifically, it assesses whether all independent variables collectively exert a statistically significant effect on the dependent variable. This test is conducted

through analysis of variance (ANOVA), which generates a significance value (Sig.). When the Sig. value, or p-value, is less than the predetermined threshold (typically 0.05), researchers may conclude that the model is statistically significant and that at least one independent variable contributes meaningfully to predicting the dependent variable. Pallant underscores the importance of the F-test as an initial diagnostic tool to establish the model's validity prior to examining the specific contributions of each predictor using the t-test (partial). Consequently, the F-test serves as a safeguard to confirm that the model is appropriately specified and not derived from random or irrelevant data.

Table 10. F-test (Simultaneous)

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	191.315	2	95,658	11,748	,000[b]
	Residual	789.925	97	8,141		
	Total	981,240	99			
a. Dependent Variable: Social interaction of early childhood (Y)						
b. Predictors: (Constant), Frequency of gadget use per day (X2), Daily duration of gadget use (X1)						

The F-test (Simultaneous) in multiple linear regression analysis serves to examine whether all independent variables collectively exert a statistically significant influence on the dependent variable. Based on the ANOVA output from the uploaded file, the simultaneous influence of the following variables was tested:

1. **X1 : Daily Duration of Gadget Use**
2. **X2 : Frequency of Gadget Use per Day**
3. **Y : Social Interaction of Young Children**

The F-test results indicate the following:

1. **F value = 11.748**
2. **Significance (Sig.) = 0.000**

The significance value is substantially lower than the critical threshold of 0.05, indicating that the combination of variables X1 and X2 exerts a statistically significant influence on Y. In other words, the constructed regression model is significant as a whole, and at least one of the independent variables contributes meaningfully to explaining the dependent variable. The results of the F-test (Simultaneous) analysis demonstrate that the overall regression model is statistically valid and significant. Both the duration and frequency of gadget use jointly affect the social interaction of young children, affirming the model's suitability as a predictive and interpretative tool within the context of this research.

The F-test indicates that the employed regression model is statistically significant. Consequently, all three hypotheses (H1, H2, and H3) are considered relevant within the context of this simultaneous analysis. However, to examine the individual influence of each independent variable, further analysis was conducted using the t-test.

T-test (partial)

In the *SPSS Survival Manual*, Julie Pallant describes the partial t-test in multiple linear regression as a statistical procedure used to assess the individual effect of an independent variable on the dependent variable, while accounting for the presence of other predictors in the model. This test involves analyzing the t-statistic and the associated significance (Sig.) value of each regression coefficient. When the Sig. value (p-value) is less than the predetermined threshold (e.g., 0.05), the independent variable is deemed to have a statistically significant

influence on the dependent variable. Pallant underscores the critical role of the t-test in identifying which variables uniquely contribute to the prediction of the outcome variable. This approach enables researchers to interpret the specific impact of each predictor within the broader context of a multivariable regression framework (Pallant, 2016).

Table 11. T-test (partial)

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10,708	2,115		5,097	,000
	Daily duration of gadget use (X1)	,325	,107	,312	3,037	,003
	Frequency of gadget use per day (X2)	,284	,099	,298	2,896	,005
a. Dependent Variable: Social interaction of early childhood (Y)						

The t-test (partial) in multiple linear regression serves as a statistical method to evaluate the significance of the individual contribution of each independent variable to the dependent variable, while accounting for the presence of other variables within the model. In the context of the uploaded data, the test is applied to the following independent variables:

1. **X1 : Daily Duration of Gadget Use**
2. **X2 : Frequency of Gadget Use per Day**
3. **Y : Social Interaction of Young Children**

The t-test results indicate that the significance value (Sig.) for X1 is 0.003, and for X2 is 0.005. Both values fall below the standard significance level of 0.05, signifying that each variable, when considered independently, exerts a statistically significant influence on early childhood social interaction. Accordingly, the partial t-test demonstrates that both independent variables contribute meaningfully to the prediction of the dependent variable. These findings are critical in research as they provide insight into which specific variables hold explanatory power regarding the phenomenon under investigation namely, the social interaction of young children.

This analysis provides stronger statistical support for the acceptance of hypotheses H1 and H2, indicating that these hypotheses are empirically substantiated by the data. In the case of H3, more precise indicators of empathy are required to validate the hypothesis conclusively; however, it may still be inferred based on the observed decline in the quality of social interactions.

DISCUSSION

The findings of this study demonstrate that gadget use measured in terms of daily duration and frequency exerts a significant influence on early childhood social interaction. These results align with the findings of Gath et al. (2025), who observed that children exposed to screen time exceeding 2.5 hours daily tend to encounter challenges in establishing social relationships as they mature. Consequently, this study reinforces the argument that excessive engagement with digital devices negatively impacts children's social development.

The F-test yielded a significance value of 0.000, which falls well below the critical threshold of 0.05, indicating that the combined effect of gadget use duration and frequency significantly contributes to variations in children's social interaction. This empirical evidence supports Vygotsky's Sociocultural Theory of Development, which posits that social interaction is a foundational mechanism for cognitive development (Luong, 2022). When screen-based engagement displaces face-to-face interactions, children are deprived of essential learning experiences within the Zone of Proximal Development.

Moreover, the t-test results show that both gadget use duration and frequency individually have a statistically significant effect on the dependent variable, with p-values of 0.003 and 0.005, respectively. These findings corroborate those of Setiani (2020) and Siregar & Yaswinda (2022), who reported that excessive gadget use undermines children's capacity for interpersonal interaction, empathy formation, and peer collaboration.

The theoretical foundation provided by socialisation theory further elucidates that the quality of a child's social environment and engagement in social networks including familial and peer interactions play a critical role in shaping their social learning (Wang et al., 2024). In this regard, uncontrolled digital interaction may hinder the development of social identity and essential communicative competencies in children.

Additionally, the coefficient of determination (R^2) value of 0.190 indicates that 19% of the variance in social interaction can be attributed to the two predictor variables, while the remaining 81% is explained by external factors not included in the model such as parenting approaches, sociocultural environment, the nature of digital content, and psychological dimensions of the child. This finding underscores the need for a multidimensional analytical perspective to comprehensively understand the determinants of social development in early childhood.

From a practical standpoint, these findings carry important implications for parents, educators, and policymakers. In urban settings such as the XYZ sub-district in Surabaya where access to digital devices is widespread yet traditional values remain entrenched it is essential to develop educational strategies that prioritize active parental supervision and prudent regulation of screen time. Furthermore, community-based initiatives should aim to complement digital exposure with structured, meaningful, face-to-face social engagements. Collectively, this study highlights the urgency of establishing public policies that enhance digital literacy within families and cultivate a social environment that supports the interpersonal development of children in an increasingly digital world.

CONCLUSIONS

This study establishes that gadget use assessed through daily duration and frequency exerts a significant influence on early childhood social interaction in urban settings, particularly in XYZ Village, Surabaya. The regression analysis demonstrates that both independent variables significantly affect the dependent variable, social interaction, as evidenced through both simultaneous (F-test) and partial (t-test) evaluations. Social interaction in this context encompasses verbal communication, cooperative behavior, and empathetic capacity. The coefficient of determination ($R^2 = 0.190$) reveals that 19% of the variance in social interaction can be attributed to gadget use patterns, while the remaining 81% is shaped by external factors such as parenting approaches, the quality of digital content, sociocultural environment, and children's psychological conditions. These findings indicate that although digital devices possess educational value, excessive and unsupervised usage may deteriorate the quality of social engagement among children. The results also align with Vygotsky's Sociocultural Theory and Social Development Theory, which underscore the fundamental role of face-to-face social interaction in facilitating children's cognitive and social development.

SUGGESTIONS

For parents, it is essential to actively supervise their children's gadget use by monitoring both the duration and the nature of the content accessed. Engaging with children during their interaction with digital media can enhance the quality of parent-child relationships while guiding gadget use toward educational and developmentally appropriate purposes.

For educators and early childhood education institutions, it is important to develop learning programs that strike a balance between technological integration and the cultivation of direct social interaction. Activities such as group-based tasks, cooperative games, and social role-playing exercises should be incorporated into the curriculum. Additionally, comprehensive training for teachers in digital literacy and interaction-oriented pedagogical strategies is crucial to support effective implementation.

For policymakers, local governments and educational authorities should establish policies that promote digital literacy within families, particularly concerning the social consequences of gadget use on early childhood development. Moreover, investment in the development of child-friendly public spaces that encourage face-to-face social engagement must be prioritized.

For future researchers, expanding the scope of investigation by including variables such as parental education level, types of digital content accessed, and children's psychological profiles is advisable. Employing longitudinal study designs may also yield more comprehensive insights into the long-term implications of gadget use on children's social development.

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