Journal of Mathematics Instruction, Social Research and Opinion
Vol. 5, No. 3, September 2026, pp. 2527 – 2537, https://doi.org/10.58421/misro.v5i3.2142
ISSN 2962-7842

Gadget Use Intensity and Learning Concentration Among Junior High School Students: The Mediating Role of Learning Motivation

Adithia Sandy Nugraha[1], Indra Maulana[2]
[1,2]Institut Prima Bangsa, Cirebon, Indonesia

Article Info

Article history:

Received 2026-09-14
Revised 2026-09-23
Accepted 2026-09-30

Keywords:

Gadget use intensity
Learning concentration
Learning motivation
Mediation analysis
Junior high school students

ABSTRACT

The increasing use of digital devices among adolescents has raised concerns regarding its potential influence on students' learning concentration, while limited evidence has examined the mediating role of learning motivation among junior high school students. Therefore, this study aimed to investigate the effect of gadget use intensity on students' learning concentration and examine the mediating role of learning motivation. This quantitative explanatory study involved 105 junior high school students from Cirebon Regency and Cirebon City, Indonesia. Data were collected using a four-point Likert scale questionnaire consisting of 17 valid items and analyzed using descriptive statistics, classical assumption tests, and mediation analysis with Hayes' PROCESS Macro Model 4 in SPSS. The results showed that gadget use intensity had no significant effect on either learning motivation or learning concentration. In contrast, learning motivation significantly improved students' learning concentration. Furthermore, learning motivation did not mediate the relationship between gadget use intensity and learning concentration. These findings indicate that improving students' learning concentration depends more on strengthening learning motivation than merely reducing gadget use intensity. Therefore, schools and teachers should prioritize instructional strategies that enhance students' motivation while encouraging responsible and educationally meaningful gadget use.

This is an open-access article under the CC BY-SA license.

Corresponding Author:

Adithia Sandy Nugraha
Informatics and Computer Engineering Education, Institut Prima Bangsa, Cirebon, Indonesia
Email: adithiasandynugraha@gmail.com

1. INTRODUCTION

Digital technology and personal gadgets have fundamentally transformed how adolescents communicate, access information, and learn [1], [2]. Globally, approximately 5.5 billion people were connected to the Internet in 2024, with youth aged 15–24 exhibiting the highest usage rate at 79% [3]. Children and adolescents are growing up in digital

environments offering both expansive educational access and risks of excessive use [4]. While digital devices provide meaningful educational opportunities, continuous exposure to digital stimulation can induce cognitive overload and distraction [5], [6]. During adolescence, frequent interruptions from non-academic content can severely compete with the attention required for schoolwork [7]. Therefore, managing the intensity and nature of gadget use is crucial for maintaining students' learning concentration.

This concern is particularly relevant in Indonesia, where internet penetration reached 79.5% in 2024, with Generation Z making up 34.40% of users [8]. The educational sector reflects this shift; 94.4% of institutions actively use internet connections, and 64.5% have implemented digital learning systems [9]. However, managing this digital access remains a challenge, as 27.7% of institutions consider restricting non-academic applications, and 11.2% report indications of non-academic activities like online gambling [9]. These figures illustrate the broader challenge of maintaining productive, distraction-free digital environments for students.

Previous research establishes a clear relationship between gadget use and learning concentration [10], [11], [12]. However, interpreting these findings requires distinguishing between mere device ownership and the specific characteristics of use. While "intensity" primarily denotes the frequency and duration of gadget use, the purpose of use is inextricably linked to how that intensity impacts cognition. Consequently, distinguishing between academic and non-academic gadget use is essential, as the purpose defines whether the high intensity functions as a learning catalyst or a source of sustained distraction.

Beyond direct attentional impacts, intensive gadget use may also affect students' motivation to learn. To understand this mechanism, Self-Determination Theory (SDT) provides a robust theoretical rationale. SDT posits that optimal motivation is driven by the fulfillment of basic psychological needs: autonomy, competence, and relatedness. Excessive smartphone use, particularly for non-academic entertainment, can displace academic activities and diminish the willingness to engage in learning, thereby frustrating the need for academic competence and reducing intrinsic motivation [13], [14]. Students with lower motivation easily become bored, lack persistence, and are highly vulnerable to external distractions [15]. From an SDT perspective, intensive, unregulated gadget use may hinder basic psychological needs in the academic domain, leading to diminished motivation, which subsequently impairs the ability to sustain concentration.

Various studies in Indonesia have documented relationships between gadget use and educational outcomes across different educational levels [16], [17], [18], [19], [20], [21], [22], [23]. Despite this extensive evidence, most research emphasizes direct associations between gadget use and outcomes like achievement or concentration, leaving the psychological mediating processes underexplored.

This limitation highlights three critical gaps. First, limited studies examine learning motivation as a mediating mechanism connecting gadget use intensity to learning concentration. Second, research on junior high school students remains scarce, despite this being a crucial developmental period where youth gain greater autonomy in their digital habits [24]. Third, local empirical evidence from Cirebon City is limited, necessitating context-specific research. To address these gaps, this study examines a mediation model

positioning learning motivation as a pathway connecting gadget use intensity with students' learning concentration. Conceptually, the proposed model evaluates a direct path from Gadget Use Intensity to Learning Concentration, alongside an indirect pathway: Gadget Use Intensity → Learning Motivation → Learning Concentration. By testing this model among junior high school students in Cirebon, this study aims to clarify whether changes in students' motivation to learn explain the relationship between their digital habits and learning concentration.

2. METHOD

This study used a quantitative approach with an explanatory research design to examine the relationships among gadget use intensity, learning motivation, and learning concentration among junior high school students. The design was chosen because the study aimed to examine the relationships among the variables and to determine whether learning motivation mediates the relationship between gadget use intensity and learning concentration. Data collection took place from 20 to 28 October 2025. Because the study involved junior high school students who are minors, strict ethical procedures were implemented. Prior to data collection, formal permission was obtained from the participating schools. Furthermore, informed consent was acquired from the students' parents or guardians, and verbal assent was obtained directly from the students. Participation was entirely voluntary, and respondent anonymity and data confidentiality were strictly maintained throughout the research process.

The population consisted of junior high school students enrolled in schools located in Cirebon City and Cirebon Regency. The schools were accessed through university students participating in a Teaching Practicum Program, introducing a convenience sampling element based on institutional access. From these accessible schools, a total of 105 students were recruited across 7 participating schools (37 students from SMPN 10 Kota Cirebon, 30 from SMPN 2 Gebang, 27 from SMPN 3 Kota Cirebon, 5 from SMPN 1 Susukan Lebak, 3 from SMPN 11 Kota Cirebon, 2 from SMPN 15 Kota Cirebon, and 1 from SMPN 7 Kota Cirebon). Within these schools, participants were selected using purposive sampling. Students were included if they were actively enrolled in junior high school, regularly used gadgets in their daily activities, and voluntarily agreed to participate. Demographically, the sample consisted of 35 males and 70 females, spanning grades 7, 8, and 9, with an approximate age range typical for junior high school students (12 to 15 years old).

The initial justification for the sample size followed the recommendation of [25], which suggests that a quantitative study using regression analysis should include a sample equivalent to five to ten times the number of observed indicators. With 18 initial measurement items, the minimum requirement was 90 respondents. Furthermore, an a priori power analysis for a regression-based mediation model indicated that a sample of 105 participants is adequate to detect a medium effect size with sufficient statistical power. Thus, the 105 students included in the analysis exceeded the minimum required criteria. The study examined three variables. Gadget use intensity (independent variable) was measured through three indicators: duration of use, frequency of use, and purpose of use.

Learning motivation (mediating variable) was measured through intrinsic motivation, extrinsic motivation, and self-regulation. Learning concentration (dependent variable) was assessed through attentional focus, sustained attention, distraction control, and learning persistence [26].

Data were collected using a self-administered questionnaire with a four-point Likert scale, ranging from 1 (Strongly Disagree) to 4 (Strongly Agree). The initial questionnaire contained 18 items (six items per construct). The items were newly developed according to the theoretical operational indicators of the three constructs [27]. Before distribution, the instrument was evaluated for content validity by academic experts to ensure clarity and relevance. For structural refinement, item validity and reliability analyses were conducted using the same primary dataset of 105 participants. Item validity was assessed using the Corrected Item–Total Correlation, while reliability was evaluated using Cronbach's Alpha, with a coefficient greater than 0.70 indicating satisfactory internal consistency [28]. Following the reliability analysis, one item from the learning concentration scale was removed to improve internal consistency, resulting in a final measurement structure of 17 valid and reliable items. Future studies may benefit from employing exploratory or confirmatory factor analysis (EFA/CFA) to provide more robust evidence of construct validity.

The data were analyzed using IBM SPSS Statistics. Descriptive statistics were used to describe the variables through mean, minimum, maximum, and standard deviation values [29]. Before hypothesis testing, classical assumption tests were performed. Normality was examined to assess data distribution, multicollinearity was evaluated using Tolerance and Variance Inflation Factor (VIF) values, and heteroscedasticity was tested. The regression model met the criteria when the Tolerance value was above 0.10, the VIF value was below 10, and no heteroscedasticity was indicated [30]

The mediation analysis was conducted using PROCESS Macro Model 4 for IBM SPSS Statistics developed by Andrew F. Hayes. This procedure estimated the direct and indirect effects among the variables. To determine the model's explanatory power, R^2 values for both the mediator and outcome models were evaluated. No demographic covariates were included in the model to maintain analytical parsimony. The indirect effect was estimated using 5,000 bootstrap resamples. Following [31], the mediation effect was considered statistically significant when the 95% bootstrap confidence interval (CI) for the indirect effect did not contain zero.

3. RESULTS AND DISCUSSION

The study involved 105 junior high school students from Cirebon City and Cirebon Regency. The collected data were analyzed using IBM SPSS Statistics through a series of analyses consisting of descriptive statistics, instrument validity and reliability testing, classical assumption testing, and mediation analysis. The findings are presented and interpreted in relation to the research objectives, particularly the relationships among gadget use intensity, learning motivation, and learning concentration.

Table 1. Descriptive Statistics of Research Variables

Variable	Number Of Items	Mean	SD	Minimum	Maximum
Gadget Use Intensity (X)	6	3.15	0.83	1.00	4.00
Learning Motivation (M)	6	3.25	0.76	1.00	4.00
Learning Concentration (Y)	6	2.91	0.84	1.00	4.00
Note, SD = Standard Deviation; N = 105					

Table 1 presents the descriptive statistics of gadget use intensity, learning motivation, and learning concentration among the 105 junior high school students who participated in the study. Gadget use intensity had a mean score of 3.15 (SD = 0.83), indicating that students generally reported relatively intensive gadget use in their daily activities. Learning motivation recorded the highest mean score, at 3.25 (SD = 0.76), suggesting that the respondents generally maintained a positive level of motivation toward learning. Meanwhile, learning concentration had a mean score of 2.91 (SD = 0.84), indicating a comparatively lower level than the other two variables. Since the descriptive statistics for learning concentration were calculated using the initial six items, including Y3, the mean score represents students' concentration before the item was subsequently removed during the reliability analysis. Overall, the mean scores ranged from 2.91 to 3.25 on the four-point Likert scale, while the standard deviations ranged from 0.76 to 0.84. These results indicate that the respondents generally reported relatively intensive gadget use, favorable learning motivation, and a comparatively lower level of learning concentration. The findings provide an initial description of the data and establish the context for the subsequent validity, reliability, assumption, and mediation analysis.

Table 2. Validity Test Results of the Gadget Use Intensity Instrument

No.	Item	Item-Total Correlation	Sig.	Decision
1	X1	0.667	0.000	Valid
2	X2	0.673	0.000	Valid
3	X3	0.607	0.000	Valid
4	X4	0.740	0.000	Valid
5	X5	0.706	0.000	Valid
6	X6	0.677	0.000	Valid
Note. N = 105; r table = 0.1918; all items were significant at p <.05.				

Table 2 shows that all six items measuring gadget use intensity met the validity criterion. The item–total correlation coefficients ranged from 0.607 to 0.740, exceeding the critical value of 0.1918, while all significance values were below 0.05. X4 showed the strongest correlation with the total score (r = 0.740), whereas X3 had the lowest coefficient (r = 0.607). Although the strength of the relationships varied across items, all six items demonstrated adequate correspondence with the overall construct and were therefore retained for subsequent analysis.

Table 3. Validity Test Results of the Learning Motivation Instrument

No.	Item	Item-Total Correlation	Sig.	Decision
1	M1	0.679	0.000	Valid
2	M2	0.623	0.000	Valid
3	M3	0.751	0.000	Valid
4	M4	0.610	0.000	Valid
5	M5	0.602	0.000	Valid
6	M6	0.666	0.000	Valid
Note. N = 105; r table = 0.1918; all items were significant at p <.05.				

As shown in Table 3, all six learning motivation items were valid. The item–total correlation coefficients ranged from 0.602 to 0.751, and each coefficient exceeded the critical value of 0.1918. All items were also statistically significant at $p < .05$. M3 had the strongest correlation with the total score ($r = 0.751$), whereas M5 showed the lowest ($r = 0.602$). Nevertheless, each item satisfied the validity requirement and was retained for further analysis.

Table 4. Validity Test Results of the Learning Concentration Instrument

No.	Item	Item-Total Correlation	Sig.	Decision
1	Y1	0.698	0.000	Valid
2	Y2	0.603	0.000	Valid
3	Y3	0.320	0.000	Valid
4	Y4	0.692	0.000	Valid
5	Y5	0.607	0.000	Valid
6	Y6	0.687	0.000	Valid
Note. N = 105; r table = 0.1918; all items were significant at p <.05.				

Table 4 indicates that all six initial items used to measure learning concentration met the validity criterion. The item–total correlations ranged from 0.320 to 0.698, and all significance values were below 0.05. Y1 showed the highest correlation ($r = 0.698$), while Y3 showed the lowest correlation ($r = 0.320$). Although the correlation of Y3 was comparatively weaker than those of the other items, it remained above the critical value and was therefore considered valid at this stage of the analysis. The subsequent reliability analysis provided a different consideration for Y3. The item was not eliminated because it failed the validity test; instead, its contribution to the internal consistency of the overall learning concentration scale was evaluated. This distinction is important because validity and reliability assess different aspects of an instrument.

Table 5. Reliability Test Results of the Research Instrument

Variable	Number of Items	Cronbach's Alpha	Criterion	Decision
Gadget Use Intensity (X)	6	0.765	≥ 0.70	Reliable
Learning Motivation (M)	6	0.726	≥ 0.70	Reliable
Learning Concentration (Y)	5	0.709	≥ 0.70	Reliable

Table 5 presents the reliability results of the three research instruments. The gadget use intensity instrument produced a Cronbach's Alpha coefficient of 0.765 across six

items. Because the coefficient exceeded the minimum criterion of 0.70, the instrument demonstrated satisfactory internal consistency, and all six items were retained. The learning motivation instrument obtained a Cronbach's Alpha coefficient of 0.726 across six items. This value also exceeded the required threshold and indicated acceptable internal consistency. Therefore, all six learning motivation items were retained for the subsequent analysis. The learning concentration instrument initially consisted of six items, including Y3. Although Y3 had been shown to be valid in the item validity analysis, the reliability analysis indicated that this item reduced the internal consistency of the scale. The initial Cronbach's Alpha was 0.647. After Y3 was removed, the coefficient increased to 0.709. Thus, the final learning concentration instrument consisted of five items and met the minimum reliability criterion of 0.70. The elimination of Y3 was therefore based on its effect on internal consistency rather than on a failure to satisfy the item validity criterion. Overall, the final instruments obtained Cronbach's Alpha coefficients of 0.765 for gadget use intensity, 0.726 for learning motivation, and 0.709 for learning concentration. These values exceeded the criterion used in the study and indicate that the final instruments had acceptable internal consistency. The instruments were therefore considered sufficiently reliable for the subsequent regression and mediation analysis.

Table 6. Normality Test Results

No.	Regression Model	Kolmogorov- Smirnov Statistic	p-value	Decision
1	Model 1 (X → M)	0.066	0.200	Normally Distributed
2	Model 2 (X, M → Y)	0.056	0.200	Normally Distributed

Table 6 shows that the residuals of both regression models satisfied the normality criterion. Model 1, which examined the relationship between gadget use intensity and learning motivation, produced a Kolmogorov–Smirnov statistic of 0.066 with a p-value of 0.200. Model 2, which included gadget use intensity and learning motivation as predictors of learning concentration, produced a statistic of 0.056 with a p-value of 0.200. Since both p-values exceeded 0.05, there was no evidence of a significant departure from normality in the residuals.

Table 7. Multicollinearity Test Results

No.	Variable	Tolerance	Sig.	Decision
1	Gadget Use Intensity (X)	0.996	1.004	No Multicollinearity
2	Learning Motivation (M)	0.996	1.004	No Multicollinearity

The multicollinearity results in Table 7 indicate that gadget use intensity and learning motivation each had a Tolerance value of 0.996 and a VIF value of 1.004. These values were within the specified criteria for an acceptable regression model. Therefore, there was no indication of problematic multicollinearity between the two predictors, allowing them to be examined simultaneously in the model predicting learning concentration.

Table 8. Heteroscedasticity Test Results

Variable	B	Std. Error	Beta	t	Sig.	Decision
Gadget Use Intensity (X)	-0.024	0.040	-0.059	-0.600	0.550	No Heteroscedasticity
Learning Motivation (M)	0.057	0.044	0.126	1.284	0.202	No Heteroscedasticity

Table 8 presents the results of the Glejser heteroscedasticity test. The significance value for gadget use intensity was 0.550, while that for learning motivation was 0.202. Both values exceeded 0.05, indicating that neither predictor had a statistically significant relationship with the absolute residuals. The regression model therefore showed no evidence of heteroscedasticity, suggesting that the variance of the residuals was sufficiently consistent across observations. Taken together, the assumption tests indicate that the regression models met the specified normality, multicollinearity, and heteroscedasticity requirements. The analysis could therefore proceed to the examination of the proposed mediation relationships.

Table 9. Mediation Analysis Results

Path	B	SE	t	P	LLCI	ULCI	Decision
X → M	0.0596	0.0894	0.6666	0.5065	-0.1177	0.2369	Not Significant
X → Y	0.0648	0.0654	0.9911	0.9911	-0.0649	0.1946	Not Significant
M → Y	0.6620	0.0719	0.0719	9.2027	0.5194	0.8047	Significant

Table 10. Total and Indirect Effects

Effect	B	BootSE	95% Boot LLCI	95% Boot ULCI	Decision
Total Effect	0.1043	0.0879	-0.0700	0.2786	Not Significant
Indirect Effect (X → M → Y)	0.0395	0.0564	-0.0752	0.1456	Not Significant

The mediation analysis presented in Table 9 provides the main evidence regarding the proposed relationships among gadget use intensity, learning motivation, and learning concentration. The first path, from gadget use intensity to learning motivation, was not statistically significant (B = 0.0596, SE = 0.0894, t = 0.6666, p = 0.5065). The confidence interval ranged from -0.1177 to 0.2369 and included zero, indicating that variations in gadget use intensity were not associated with statistically significant differences in students' learning motivation. The relatively small coefficient also suggests that the intensity of gadget use alone provided limited explanation for differences in students' motivation to learn. The second path showed that gadget use intensity did not significantly predict learning concentration (B = 0.0648, SE = 0.0654, t = 0.9911, p = 0.3240). The confidence interval (-0.0649 to 0.1946) included zero, indicating that the direct relationship was not statistically supported. Thus, the present findings do not provide sufficient evidence that greater gadget use intensity was associated with either higher or lower learning concentration among the respondents.

The absence of a significant relationship between gadget use intensity and learning motivation differs from the findings of [13], who reported a potential negative relationship between excessive smartphone use and adolescents' learning motivation. However, the two studies did not necessarily measure the same aspect of digital behavior. The present study

focused on gadget use intensity based on duration, frequency, and purpose, whereas excessive or problematic smartphone use may involve behavioral characteristics that are not captured by intensity alone. Therefore, the present findings suggest that the amount or intensity of gadget use should not automatically be interpreted as an indicator of reduced learning motivation.

The non-significant direct relationship between gadget use intensity and learning concentration also differs from several previous studies reporting associations between gadget use and concentration. [10], [11], [16] examined relationships between gadget or smartphone use and students' concentration, while [12] reported a statistically significant, although relatively modest, influence of gadget-use frequency on learning concentration and academic achievement. This discrepancy highlights a critical measurement issue within the present study: the inclusion of "purpose of use" within the gadget-intensity scale. Purpose describes the contextual nature of use, whereas intensity strictly reflects behavioral volume (duration and frequency). Combining these into a single construct may have masked opposing effects. For instance, high intensity for academic purposes might maintain or support concentration, whereas high intensity for non-academic entertainment might diminish it. This conflation likely contributed to the non-significant results.

In contrast, learning motivation had a positive and statistically significant relationship with learning concentration ($B = 0.6620$, $SE = 0.0719$, $t = 9.2027$, $p < .001$). The confidence interval ranged from 0.5194 to 0.8047, indicating a stable positive association. This significant relationship between learning motivation and learning concentration is consistent with the broader argument that motivation is closely related to students' engagement and persistence during learning. [15] suggested that students with lower motivation may be more vulnerable to boredom, reduced persistence, and external distractions. [14] also demonstrated the relevance of learning motivation to students' academic outcomes. The present finding extends this perspective by showing that learning motivation was significantly associated with learning concentration. Within the current sample, students' motivation to engage in learning was more closely related to their capacity to sustain attention than their overall volume of gadget use.

As shown in Table 10, the total effect of gadget use intensity on learning concentration was not statistically significant. More importantly, the estimated indirect effect through learning motivation was 0.0395 (BootSE = 0.0564), with a 95% bootstrap confidence interval ranging from -0.0752 to 0.1456. Because zero was included within the confidence interval, learning motivation did not mediate the relationship between gadget use intensity and learning concentration. Theoretically, this non-significant mediation result suggests that learning motivation as a general construct may be too broad to capture the specific cognitive disruptions caused by digital devices. The impacts of intensive gadget use might bypass general academic motivation and operate through more specific behavioral or physiological mechanisms. For instance, intensive gadget use may be more directly linked to alternative mediators such as self-regulation depletion, multitasking habits during study sessions, or impaired sleep quality, rather than fundamentally altering a student's intrinsic desire to learn.

4. CONCLUSION

The findings provide a more nuanced understanding of the relationship between gadget use, learning motivation, and learning concentration among junior high school students. Gadget use intensity was not significantly associated with learning motivation or learning concentration, and learning motivation did not mediate the relationship between gadget use intensity and learning concentration. In contrast, learning motivation showed a positive and significant relationship with learning concentration. Therefore, within this sample, learning motivation showed a stronger statistical association with concentration than gadget-use intensity. These findings suggest that gadget use intensity alone may not be sufficient to explain differences in students' learning concentration. Rather, the educational implications of digital technology should be understood in relation to how students engage with learning and the broader conditions surrounding gadget use.

The findings offer several practical implications to be further tested in future educational settings. Schools and teachers might look beyond simply restricting gadget duration, placing greater emphasis on creating environments that strengthen students' engagement, persistence, and learning goals. Parents may also benefit from monitoring the purpose and context of gadget use rather than just regulating total screen time. However, these conclusions must be interpreted in light of several main limitations: the cross-sectional design of the study, the reliance on self-reported gadget use, the use of purposive sampling, the limited geographical coverage in the Cirebon region, and the lack of distinction between academic and non-academic gadget use. To address these gaps, future studies should employ objective screen-time measures, recruit larger probability-based samples, and examine more specific dimensions of gadget use. Specifically, a longitudinal mediation design would be particularly valuable for testing whether changes in digital behavior temporally precede changes in motivation and subsequent alterations in learning concentration.

REFERENCES

[1] Z. Farhani, K. Amanda, L. B. Mellaty, and Z. Sesmiarni, "Analisis Perubahan Motivasi Belajar Siswa Di Tengah Tingginya Penggunaan Smartphone," *KOLONI*, vol. 4, no. 4, pp. 39–50, 2025.

[2] G. Salza and R. Samuel, "Digital engagement and youth: a scoping review of opportunities, risks, and the role of socioeconomic resources," *Information, Commun. Soc.*, vol. 29, no. 9, pp. 2756–2774, Jul. 2026, doi: 10.1080/1369118X.2025.2574297.

[3] I. T. Union, "Measuring digital development: Facts and Figures 2024," Telecommunication Development Bureau, International Telecommunication Union, Geneva, Switzerland, 2024. [Online]. Available: https://www.itu.int/itu-d/reports/statistics/facts-figures-2024/

[4] UNICEF, "Childhood in a Digital World: Screen time, digital skills and mental health," UNICEF Innocenti, Florence, Italy, 2025. [Online]. Available: https://www.unicef.org/innocenti/

[5] V. J. Clemente-Suárez *et al.*, "Digital Device Usage and Childhood Cognitive Development: Exploring Effects on Cognitive Abilities," *Children*, vol. 11, no. 11, 2024, doi: 10.3390/children11111299.

[6] S. Mallawaarachchi *et al.*, "Early Childhood Screen Use Contexts and Cognitive and Psychosocial Outcomes: A Systematic Review and Meta-analysis," *JAMA Pediatr.*, vol. 178, no. 10, pp. 1017–1026, Oct. 2024, doi: 10.1001/jamapediatrics.2024.2620.

[7] F. Sticca, V. Brauchli, and P. Lannen, "Screen on = development off? A systematic scoping review and a developmental psychology perspective on the effects of screen time on early childhood development," *Front. Dev. Psychol.*, vol. Volume 2-, 2025, doi: 10.3389/fdpys.2024.1439040.

[8] APJI, "Internet Indonesia," 2024. [Online]. Available: https://survei.apjii.or.id/survei/group/9

[9] APJII, "Profil Internet Indonesia 2026 Survei Peran Internet Sebagai perwakilan Pengurus APJII , mempersembahkan Profil Internet Indonesia 2026," 2026.
[10] I. Julfan and H. Haifaturrahmah, "Dampak Penggunaan Gadget terhadap Konsentrasi Belajar Siswa," *Action Res. J. Indones.*, vol. 7, no. 4, 2025, doi: 10.61227/arji.v7i4.621.
[11] F. Febriani, Haifaturrahmah, and S. Muhdar, "Dampak Penggunaan Gadget Terhadap Konsentrasi Belajar Siswa Sekolah Dasar," *Pendas J. Ilm. Pendidik. Dasar*, vol. 10, no. 04, pp. 243–252, 2025.
[12] T. M. Nasir, M. Sabarudin, M. Yudiyanto, B. W. Nuryadin, and others, "Frekuensi Penggunaan Gadget dan Implikasinya terhadap Prestasi Akademik serta Konsentrasi Siswa," *J. Intelekt. Keislaman, Sos. dan Sains*, vol. 14, no. 1, pp. 92–99, 2025.
[13] Y. Ramadhani, M. R. Ruswandi, and A. K. Iman, "Pengaruh Kecanduan Smartphone Terhadap Motivasi Belajar," *J. Keilmuan Pendidik.*, vol. 1, no. 2 SE-Articles, pp. 56–62, Dec. 2025, doi: 10.63203/040924300.
[14] S. Wahyuni, D. Vivianti, and P. A. Simanungkalit, "Pemanfaatan smartphone dan motivasi belajar terhadap prestasi belajar," *Davar J. Teol.*, vol. 4, no. 1, pp. 36–51, 2023.
[15] R. Cohen, I. Katz, N. Aelterman, and M. Vansteenkiste, "Understanding shifts in students' academic motivation across a school year: the role of teachers' motivating styles and need-based experiences.," *Eur. J. Psychol. Educ. = J. Eur. Psychol. l'education*, pp. 1–26, Oct. 2022, doi: 10.1007/s10212-022-00635-8.
[16] Y. K. Sari, Y. M. Nur, and R. J. Safitri, "Hubungan Penggunaan Smartphone Dengan Konsentrasi Belajar Siswa Di SMP N 2 Enam Lingkung," *Menara Ilmu J. Penelit. dan Kaji. Ilm.*, vol. 17, no. 1, 2023.
[17] T. Adelia, T. Fauzi, and A. Arizona, "pengaruh penggunaan gadget terhadap konsentrasi belajar siswa di SMA Negeri 6 Prabumulih," *J. Wahana Konseling*, vol. 4, no. 1, pp. 35–45, 2021.
[18] N. Nikmawati, H. S. Bintoro, and S. Santoso, "Dampak Penggunaan Gadget terhadap Hasil Belajar dan Minat Belajar Siswa Sekolah Dasar," *J. Edutech Undiksha*, vol. 9, no. 2 SE-Articles, pp. 254–259, Sep. 2021, doi: 10.23887/jeu.v9i2.38975.
[19] F. Purwantoro and S. Nafsah, "Pengaruh Penggunaan Gawai (Gadget) Terhadap Hasil Belajar Siswa," *Indones. J. Educ. Basic*, vol. 1, no. 2, pp. 113–120, 2023.
[20] D. Ramdani and R. Mesra, "Pengaruh Penggunaan Gadget Terhadap Hasil Belajar Siswa Pada Mata Pelajaran Sosiologi di SMAN 1 Sukaraja Kabupaten Bogor," *ETIC (EDUCATION Soc. Sci. JOURNAL)*, vol. 1, no. 3, pp. 207–233, 2024.
[21] B. R. Zega and A. R. Harefa, "Pengaruh penggunaan gadget terhadap hasil belajar siswa di SMA Negeri 2 Gunungsitoli," *J. Educ.*, vol. 6, no. 01, pp. 5357–5363, 2023.
[22] M. Hasanah and I. N. Inayati, "Pengaruh Penggunaan Gadget dan Motivasi Belajar Terhadap Prestasi Belajar Siswa Kelas Atas di MI Miftahul Huda Kepanjen," in *International Seminar On Islamic Education & Peace*, 2022, pp. 375–383.
[23] L. Supriani, M. A. R. Asrori, and N. U. Hadi, "Determinasi Penggunaan Gadget dan Motivasi Belajar terhadap Prestasi Belajar Siswa Kelas Atas Sekolah Dasar," *Pendas J. Ilm. Pendidik. Dasar*, vol. 10, no. 03, pp. 220–234, 2025.
[24] F. Dietrich, A. Arenz, and L. Reinecke, "What Constitutes Experiences of Autonomy in Digital Technology Use? A (Computational) Scoping Review Through the Lens of Self-Determination Theory," *Interact. Comput.*, vol. 38, no. 3, pp. 487–500, May 2026, doi: 10.1093/iwc/iwae050.
[25] J. F. Hair, W. C. Black, B. J. Babin, and R. E. Anderson, *Multivariate Data Analysis*, 8th ed. Andover, Hampshire: Cengage Learning, 2019.
[26] Prashanth Gowda Parameshwara, "Debate around and impact of digital screen time and media parenting on children's development," *Clin Exp Pediatr*, vol. 68, no. 7, pp. 551–553, 2025, doi: 10.3345/cep.2025.00073.
[27] W. M. Lim, P. Khatri, A. Shiva, and V. Dabas, "Guidelines for Scale Development and Validation," *J. Consum. Behav.*, vol. 25, no. 2, pp. 953–973, 2026, doi: https://doi.org/10.1002/cb.70096.
[28] "Effect of Variability on Cronbach Alpha Reliability in Research Practice," *J. Mat. Stat. dan Komputasi*, vol. 17, no. 2 SE-Research Articles, pp. 223–230, doi: 10.20956/jmsk.v17i2.11655.
[29] G. Fulk, "Descriptive Statistics, An Important First Step," *J. Neurol. Phys. Ther.*, vol. 47, no. 2, p. 63, 2023, doi: 10.1097/NPT.0000000000000434.
[30] N. Djamil, "Factors affecting the Quality of Financial Reports: A Value Relevance Based Analysis," *J. Rumpun Ilmu Ekon.*, vol. 1, no. 1 SE-Articles, pp. 1–11, Dec. 2023, doi: 10.5281/zenodo.10695247.
[31] J.-J. Igartua and A. F. Hayes, "Mediation, Moderation, and Conditional Process Analysis: Concepts, Computations, and Some Common Confusions," *Span. J. Psychol.*, vol. 24, p. e49, 2021, doi: DOI: 10.1017/SJP.2021.46.