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Digital Gadget Use and Children's Social-Emotional Development: A Psychological Study in Elementary School Contexts

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ABSTRACT Digital gadget use is embedded in children's learning and everyday relationships, but its association with social-emotional development requires attention to context and measurement. This study examined that association among 120 students in Grades IV–VI in Batusangkar, Tanah Datar Regency, West Sumatra, Indonesia. A quantitative cross-sectional correlational design used structured five-point Likert questionnaires and descriptive statistics, Pearson correlation, and simple linear regression. Mean gadget-use and social-emotional scores were 65.47 (SD=9.84) and 78.32 (SD=8.17), respectively. The reported correlation was negative, r=-.364, p<.001; an approximate 95% confidence interval calculated from the reported correlation was -.510 to .-198. The association does not establish causality, problematic use, or a universal exposure threshold. Findings support further investigation of content, purpose, family mediation, and opportunities for interpersonal interaction, alongside context-sensitive school family support.

Keywords: *Digital Gadget Use; Social-Emotional Development; Elementary School Children; Child Psychology; Social Competence.*

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INTRODUCTION

Digital devices now form part of the settings in which children study, play, and maintain relationships. Their developmental significance depends on the experiences they enable and the activities they replace. Evidence synthesized across reviews indicates that associations differ by outcome and that a single total-screen-time measure obscures substantial variation (Sanders et al., 2024; Stiglic & Viner, 2019). The increase in screen exposure documented during the COVID-19 pandemic also shows that children's media habits respond to changes in schooling and family routines (Madigan et al., 2022). These findings establish the need to examine gadget use within its educational and social context, rather than assume that access to a device is itself a developmental risk.

Social-emotional development encompasses capacities to recognize and regulate emotions, cooperate, empathize, and sustain relationships. In elementary school, these capacities are practiced through shared tasks, disagreements, and feedback from adults and peers. Meta-

analyses of school-based social and emotional learning show that these skills can be supported through intentional educational experiences, with benefits extending beyond immediate classroom performance (Cipriano et al., 2023; Taylor et al., 2017). Consequently, the relevant question is whether children's patterns of gadget use coexist with, support, or restrict the interpersonal opportunities through which these competencies develop.

The international evidence warrants concern without supporting a uniform harmful-effects account. A meta-analysis of children aged 12 years or younger identified small associations between screen time and internalizing and externalizing behavior problems (Eirich et al., 2022). Research in younger children further distinguishes content, background exposure, caregiver use, and co-use as potentially relevant contexts (Mallawaarachchi et al., 2024). Developmental screening and language studies provide adjacent evidence about early development, but their outcomes are not interchangeable with social-emotional competence (Madigan et al., 2019, 2020). Findings from preschool samples therefore inform possible explanations without directly estimating effects in Grades IV–VI.

Evidence closer to the present age group illustrates why activity and setting matter. Research with children aged 9–12 years links digital practices to context-specific self-regulation and social skills, with some recreational activities associated with lower self-regulation but more favorable social ratings in digital contexts (McNaughton et al., 2022). Longitudinal gaming research also identifies associations in both directions, with results varying by age and sex (Hygen et al., 2020). These findings challenge the assumption that every child with high gadget involvement will show the same social profile or that device use necessarily precedes social difficulty.

Emotional regulation offers another plausible connection. Longitudinal research on using devices to calm preschoolers and on tablet use and anger suggests that digital behavior and emotional reactivity can become interrelated over time (Fitzpatrick et al., 2024; Radesky et al., 2023). However, a questionnaire association cannot establish whether a device prevents emotion-regulation practice, whether a distressed child seeks a device, or whether both reflect family circumstances. Research on parental mediation and children's screen experiences emphasizes the relevance of adult guidance and the developmental appropriateness of content (Chang et al., 2019; Swider-Cios et al., 2023). These considerations motivate an interpretation that remains open to reciprocal processes.

Family relationships are particularly relevant in Indonesian educational settings. Research in Cirebon links smartphone addiction indicators, family cohesion, and interpersonal communication with children's emotional dysregulation (Rachmat et al., 2021). Research with parents of elementary pupils in Yogyakarta likewise situates engagement in children's character education within parenting and relational characteristics (Diana et al., 2021). An ethnographic study of marginalized families further shows that parental involvement takes place under material and social constraints (Septiarti et al., 2022). These studies support attention to family context; they do not establish that the same mechanisms operate in Batusangkar or that parents have equal resources for supervising digital activity.

Measurement must distinguish frequency of use from problematic use. A validated parent-report measure of problematic media use addresses behavioral difficulties surrounding media rather than simply counting exposure (Domoff et al., 2019). Cross-national adolescent research similarly distinguishes intense social media use from problematic use (Boer et al., 2020). Large adolescent studies and reviews report small, mixed, or nonlinear associations with well-being and identify developmental differences (Odgers & Jensen, 2020; Orben et al., 2022; Orben & Przybylski, 2019; Przybylski & Weinstein, 2017). Because these studies concern older populations and different outcomes, they serve as methodological cautions against universal thresholds, not as direct estimates for elementary-school children.

The present study addresses a local evidence need by examining gadget-use and social-emotional questionnaire scores among students in Grades IV–VI in Batusangkar, West Sumatra. The contribution is a sample-specific estimate of their association within an Indonesian primary-school setting. It does not test the effects of particular applications, identify mediation, or establish developmental change. Research that explicitly connects parental engagement, screen time, and social competence supports investigating these variables together in future designs (Ma et al., 2024).

Accordingly, this study asks whether higher digital gadget-use scores are associated with lower social-emotional development scores. The research objective is to describe both score distributions and estimate the direction and strength of their relationship. A negative association is hypothesized, while recognizing that the composite exposure measure may combine activities with different developmental implications. The findings are intended to inform further inquiry and context-sensitive school–family support, rather than determine a causal effect or prescribe a universal screen-time limit.

METHOD

This study employed a quantitative cross-sectional correlational research design to examine the relationship between digital gadget use and children's social-emotional development in elementary school contexts. The study was conducted in several elementary schools in Batusangkar, Tanah Datar Regency, West Sumatra, Indonesia, during the 2025/2026 academic year. The population consisted of elementary school students who regularly used digital gadgets such as smartphones, tablets, or computers in their daily activities. Data were collected using structured questionnaires measuring digital gadget use and children's social-emotional development. The research was designed to identify whether differences in children's patterns of gadget use were significantly associated with their social-emotional development.

The participants were 120 elementary school students from Grades IV–VI, selected using proportionate random sampling to ensure representation across the participating schools and grade levels. Students were included if they regularly used a digital gadget, were able to complete the questionnaire independently with appropriate guidance, and obtained parental or guardian consent to participate. Digital gadget use was measured through indicators including frequency, duration, purpose of use, type of digital activity, and patterns of use for learning and entertainment. Social-emotional development was assessed through indicators of emotional regulation, empathy, social interaction, cooperation, self-control, and interpersonal competence. All questionnaire items were measured using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

The gadget-use instrument comprised 20 items and the social-emotional instrument comprised 24 items. Scores are interpreted as questionnaire totals, not direct measures of screen hours or clinical functioning. A higher social-emotional score was treated as more favorable functioning, in accordance with the direction used in the original analysis. Descriptive statistics summarized sample size, observed minimum and maximum, mean, and standard deviation. The reported analysis included internal-consistency estimates, Kolmogorov–Smirnov and linearity tests, Pearson correlation, and simple linear regression, with a significance criterion of $p < .05$. The regression was unadjusted. An approximate 95% confidence interval for the reported Pearson correlation was calculated using the Fisher z transformation and a standard error equal to the reciprocal square root of N minus three. This supplementary interval is based on rounded summary statistics; it is not a reanalysis of individual-level observations.

RESULT AND DISCUSSION

Result

The sample consisted of 120 students in Grades IV–VI. Tables 1–7 retain the numerical results reported for the two questionnaire variables. Table 8 adds a summary of the correlation and its approximate uncertainty. Descriptive categories are not assigned because validated classification thresholds are not documented.

Descriptive statistics

Table 1. Descriptive statistics of study variables

Variable	N	Minimum	Maximum	Mean	SD
Digital Gadget Use	120	42	89	65.47	9.84
Social-Emotional Development	120	58	96	78.32	8.17
Valid N	120				

Gadget-use scores ranged from 42 to 89 (M = 65.47, SD = 9.84), and social-emotional scores ranged from 58 to 96 (M = 78.32, SD = 8.17). These are observed score ranges. Without a validated reference distribution or cutoffs, they do not establish whether individual students have low, moderate, or high exposure or development.

Instrument reliability

Table 2. Internal consistency of the instruments

Variable	Number of Items	Cronbach's Alpha	Interpretation
Digital Gadget Use	20	.891	Reliable
Social-Emotional Development	24	.914	Reliable

Cronbach's alpha was .891 for gadget use and .914 for social-emotional development. These coefficients indicate substantial consistency among the items within this sample. Internal consistency does not establish unidimensionality or content and construct validity, and no additional validity coefficients are provided in the reported results.

Assumption checks

Table 3. Reported normality and linearity checks

Test	Statistic	Sig.	Decision
Kolmogorov–Smirnov	.061	.200	Normal
Linearity	1.184	.282	Linear

The reported Kolmogorov–Smirnov significance value was .200. A nonsignificant test does not prove normality, and the output does not identify whether the test concerned a variable or regression residuals. The linearity result was reported as 1.184, p = .282. This p value supports no detected departure from linearity only if it refers to the deviation-from-linearity component. The original output and residual plots are needed to assess the assumptions fully.

Pearson correlation

Table 4. Pearson correlation of gadget use and social-emotional development

Variables	Digital Gadget Use	Social-Emotional Development
Digital Gadget Use	1.000	−.364
Social-Emotional Development	−.364	1.000
Sig. (2-tailed)	—	< .001
N	120	120

The reported Pearson correlation was negative, $r = -.364$, $p < .001$, $N = 120$. Students with higher gadget-use questionnaire scores tended to report lower social-emotional scores. The estimate is an unadjusted association; it does not establish temporal order or a causal effect.

Simple linear regression

Table 5. Regression model summary as reported

R	R^2	Adjusted R^2	Std. Error of Estimate
.364	.132	.125	7.64

The model summary reported $R = .364$, $R^2 = .132$, adjusted $R^2 = .125$, and a standard error of estimate of 7.64. $R^2 = .132$ would correspond to approximately 13.2% of observed outcome variance represented by the fitted model. This interpretation remains provisional because the ANOVA quantities below imply a different model fit.

Table 6. Regression ANOVA as reported

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	931.84	1	931.84	15.96	< .001
Residual	6,893.42	118	58.42		
Total	7,825.26	119			

The reported ANOVA statistic was $F(1, 118) = 15.96$, $p < .001$. The regression and residual sums of squares were 931.84 and 6,893.42, respectively, with a total of 7,825.26. Although this output reports statistical significance, its sums of squares do not reproduce the R^2 in Table 5. No replacement estimates are inferred from these inconsistent summaries.

Table 7. Regression coefficients as reported

Predictor	B	SE	Beta	t	Sig.
Constant	96.482	4.69	—	20.57	< .001
Digital Gadget Use	−.277	.069	−.364	−4.00	< .001

The reported gadget-use coefficient was B = −.277 (SE = .069), β = −.364, t = −4.00, p < .001, with an intercept of 96.482. These values yield the reported equation $\hat{Y} = 96.482 - 0.277X$. However, the combination of the reported correlation and standard deviations does not reproduce B = −.277. The coefficient and model-fit statistics therefore require verification before the equation is used for prediction or a unit-change interpretation.

Table 8. Summary of the reported association and supplementary uncertainty

Quantity	Value	Interpretation
Sample size	120	Students in Grades IV–VI
Pearson r	−.364	Negative unadjusted association
Approximate 95% CI	−.510 to −.198	Fisher z interval from rounded r and N
Reported p	< .001	Evidence against zero linear correlation
Squared correlation	≈ .1325	Derived r^2, not a reconciled regression model

Note. The interval and squared correlation are supplementary calculations from the reported r and N. They do not resolve inconsistencies between the regression tables. No individual observations or subgroup results were reconstructed.

Discussion

Interpreting the association

The reported correlation, r = −.364, indicates that students with higher gadget-use scores tended to have lower social-emotional scores in this sample. The approximate 95% confidence interval, calculated from the rounded correlation and N = 120, is −.510 to −.198. This interval conveys the uncertainty in the estimated association; it does not describe an intervention effect or a developmental trajectory. The result is consistent in direction with the literature relating greater screen exposure to behavioral difficulties, but the measures have opposite scoring directions: higher difficulty scores indicate poorer functioning, whereas higher scores in this study indicate more favorable functioning (Eirich et al., 2022).

The magnitude is larger than the small pooled associations commonly reported in screen-use syntheses (Eirich et al., 2022; Sanders et al., 2024). That difference should not be interpreted as evidence that children in Batusangkar are intrinsically more vulnerable. A composite gadget-use scale differs from a duration measure, and reporting tendencies, sample composition, and unmeasured family characteristics can influence correlations. Evidence from adolescent well-being research also shows that estimates depend on analytical decisions and the outcome being studied (Odgers & Jensen, 2020; Orben & Przybylski, 2019). The present estimate is therefore most defensible as a relationship between two measured scores in a defined sample.

The reported R^2 of .132 is broadly compatible with the squared correlation, suggesting approximately 13.2% shared variance if both statistics came from the same complete-case model. However, the reported ANOVA sums of squares and F statistic do not reproduce that value. The regression estimates therefore require reconciliation before precise claims about model fit are finalized. Even a verified R^2 would describe statistical fit, not the percentage of a child's development caused by gadget use. The unexplained variance cannot be allocated to specific family, school, or individual factors without measuring and modeling them.

Interpreting the descriptive scores

The mean gadget-use score of 65.47 and social-emotional score of 78.32 describe the observed distributions. They do not independently justify classifying use as moderate or development as good because validated cutoffs and normative comparisons are not reported. Nor can the gadget score be converted into hours per day. Objective device-sampling research demonstrates discrepancies between reported and recorded exposure, reinforcing the need to distinguish questionnaire endorsement from actual screen duration (Radesky et al., 2020).

The measurement distinction also prevents labeling high-scoring students as addicted. Problematic media use involves functional or behavioral difficulties that require appropriate assessment (Domoff et al., 2019). Evidence distinguishing intense from problematic social media use in adolescents reinforces this conceptual separation, although that population differs from the present sample (Boer et al., 2020). Subsequent work should report item wording, scoring direction, and subscale structure so that educational use, entertainment, frequency, and interference with daily functioning are not treated as equivalent constructs.

Social interaction and displacement

One plausible explanation is that some digital activities compete with opportunities for conversation, cooperative play, and conflict resolution. Such displacement is a proposed mechanism, not an observed result here: the study did not measure time allocation or parent–child interaction. Research in Taiwan places children's mobile-device habits alongside parental mediation, underscoring the need to examine digital activity within family practices (Chang et al., 2019). The same amount of device use may therefore have different implications when a child creates a project with peers, discusses a story with an adult, or watches videos alone.

The longitudinal evidence also leaves room for selection into digital activities. In Norwegian children, social competence predicted later gaming, while an association from gaming to later social competence was restricted to a particular age and sex subgroup (Hygen et al., 2020). Elementary-school research similarly reports differences between social skills in digital and non-digital settings (McNaughton et al., 2022). These findings suggest that a student may experience belonging online while struggling in face-to-face contexts. A total social-emotional score cannot identify that pattern, and a negative overall correlation should not be generalized to every form of digital social participation.

Emotional regulation and reciprocal processes

Using devices to manage distress is another possible pathway. Longitudinal studies associate device-based calming and tablet use with later emotional reactivity or anger, while also identifying aspects of reciprocal association (Fitzpatrick et al., 2024; Radesky et al., 2023). Repeated reliance on a device could reduce opportunities to practice tolerating frustration, but a child who already struggles with regulation may also elicit more device-based soothing. Because the present data were collected at one time point, neither explanation can be preferred on the basis of the correlation alone.

Evidence concerning language and general developmental screening suggests additional domains through which children's everyday participation could be affected (Madigan et al., 2019, 2020). Nevertheless, language skills, broad developmental screening scores, and social-emotional competence remain distinct outcomes. Neuroimaging studies have examined associations involving white matter and emotion-processing networks, including possible moderation by parent–child reading (Huang et al., 2024; Hutton et al., 2020). These studies motivate further investigation but do not demonstrate neurological damage in this sample. No biological measures were collected, and the present results should remain at the behavioral questionnaire level.

Family mediation and Indonesian context

Adult mediation is relevant both to the content children encounter and to the quality of the relationship surrounding device use. Evidence links parental engagement with social competence and highlights the role of co-use and mediation in early childhood (Ma et al., 2024; Swider-Cios et al., 2023). Caregiver distraction deserves attention alongside children's habits: research on technoference associates interruptions during parent–child interaction with child behavior problems (McDaniel & Radesky, 2018). Families may therefore benefit from discussing shared expectations for adult and child device use rather than assigning responsibility solely to children.

The Indonesian literature strengthens this relational interpretation without establishing a causal mechanism. The Cirebon study places emotional dysregulation alongside family cohesion, interpersonal communication, and smartphone addiction indicators (Rachmat et al., 2021). The Yogyakarta study connects positive parenting and parental characteristics with engagement in character education (Diana et al., 2021). Taken together, these studies support family communication as an appropriate consideration in planning support. They do not show that parenting mediated the Batusangkar correlation, since the present model contains no parenting variable.

Recommendations must also remain feasible for families with unequal time, connectivity, and learning resources. Ethnographic evidence from marginalized families in Yogyakarta describes involvement in education within constrained social conditions (Septiarti et al., 2022). A school–family partnership should therefore begin by understanding what children use devices for, who can accompany them, and which offline alternatives are available. Flexible routines and accessible shared activities are more likely to be practical than assuming that every household can provide continuous supervision.

Content and educational opportunities

A negative aggregate association does not mean that every digital activity undermines development. The contextual meta-analysis distinguishes age-inappropriate content, background television, caregiver use, and co-use; associations vary across psychosocial and cognitive outcomes (Mallawaarachchi et al., 2024). Co-use findings for cognition should not be presented as direct proof of improved social-emotional functioning. Similarly, pandemic research differentiates several forms of screen use in relation to mental-health symptoms (Li et al., 2021). Content and context thus offer plausible sources of heterogeneity that the present composite score cannot disentangle.

The rise in screen exposure during the pandemic illustrates how schooling and household routines can shape digital behavior (Madigan et al., 2022). Findings concerning nonlinear associations and developmental sensitivity in adolescents further caution against applying a single exposure threshold across ages (Orben et al., 2022; Przybylski & Weinstein, 2017). For elementary education, the practical implication is to specify the learning purpose of device use and preserve opportunities for discussion, cooperation, and reflection. The present study cannot determine an optimal number of hours or establish that educational screen use is uniformly beneficial.

Implications for elementary education

Schools can treat digital self-regulation as part of a broader social and emotional learning agenda. Activities might include planning device use around a task, discussing online interactions, recognizing frustration, and resolving disagreements with peers. Evidence from meta-analyses supports the potential of structured school-based social and emotional learning, although program content and implementation affect outcomes (Cipriano et al., 2023; Taylor et al., 2017). These results justify considering such approaches; they do not establish that a particular program would be effective in the participating schools without evaluation.

Locally familiar group activities can provide an appropriate complement. Qualitative research on modified Gobak Sodor in primary schools describes opportunities for responsibility, cooperation, communication, and care for others (Irmansyah et al., 2020). A separate design-based study developed and validated a character-education model combining traditional games with Socratic questioning (Hafina et al., 2022). These studies offer concrete instructional possibilities, but neither is evidence that traditional games reverse the association observed here. Teachers could adapt activities to their students and evaluate participation and social behavior over time.

Experimental evidence gives a more specific but bounded basis for considering changes to family media routines. A Danish trial's secondary analysis found short-term improvements in behavioral difficulties and prosocial behavior after a family screen-reduction intervention (Schmidt-Persson et al., 2024). The intensive two-week intervention, its setting, and its outcome measures differ from this correlational study. Its numerical screen limit should not be transferred directly to Indonesian households as a recommendation. A local pilot would need to assess acceptability, educational access, adherence, and whether any changes are sustained.

Limitations and further research

Several features limit interpretation. The cross-sectional design does not establish temporal ordering, and the unadjusted model cannot separate gadget use from potential confounding. Students were drawn from Grades IV–VI in one locality and were eligible as regular users, so findings do not describe all ages, non-users, or all Indonesian schools. The reported sampling procedure also requires fuller information about school and grade allocation. High internal-consistency coefficients do not by themselves establish that the questionnaires validly distinguish the intended constructs.

The reporting of normality and linearity tests requires clarification, and the regression outputs must be checked against the original analysis. Future reporting should identify which variable or residual was tested, distinguish the deviation-from-linearity test, and include residual diagnostics. Future studies could combine device-use records, child reports, and parent or teacher assessments; objective measurement evidence indicates why relying on one report source can be limiting (Radesky et al., 2020). Repeated observations could then test temporal associations while accounting for baseline functioning and family context.

The main contribution is therefore a locally situated negative association that supports more detailed investigation, rather than a conclusion that gadgets determine social-emotional development. Subsequent work should separate content, purpose, co-use, and interference with daily activities, and test mechanisms only when they are measured. This approach follows the differentiated evidence in reviews of screen contexts and youth outcomes (Mallawaarachchi et al., 2024; Sanders et al., 2024). It also provides a clearer basis for evaluating supportive school and family practices without overstating what a single cross-sectional model can establish.

CONCLUSION

Among 120 elementary-school students in Batusangkar, higher gadget-use questionnaire scores were associated with lower social-emotional scores (reported $r = -.364$, $p < .001$). The study supports a sample-specific association, not a causal effect, a diagnosis of problematic use, or a threshold for safe screen exposure. The inconsistent regression outputs must be reconciled before their precise explanatory contribution is finalized.

Educational responses should consider the purpose and context of digital activities alongside opportunities for cooperation, emotional regulation, and direct interaction. School–family collaboration and carefully evaluated social and emotional learning activities offer

directions for further work. Longitudinal research with clearly documented instruments, multiple informants, and measures of content and family mediation is needed to clarify the relationship.

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