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**Original Research Article**

# The Relationship Between Screen Time Duration and Personal Social Development of Toddlers Aged 2–5 Years in Kupang: A Cross-Sectional Study

Astria Maghfiroh Nurrohmah[1*], Christina Olly Lada[2], Gottfrieda Patiencia Taeng-Ob Adang[3], Insani Fitrahulil Jannah[4]

[1]Medical Education Study Program, Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana, East Nusa Tenggara, Indonesia
[2]Department of Dryland and Archipelagic Medicine, Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana, East Nusa Tenggara, Indonesia
[3]Department of Obstetrics and Gynecology, Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana, East Nusa Tenggara, Indonesia
[4]Department of Biomedicine, Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana, East Nusa Tenggara, Indonesia

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***Corresponding Author:** Astria Maghfiroh Nurrohmah
Medical Education Study Program, Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana, East Nusa Tenggara, Indonesia

## Abstract

The digital era has markedly increased screen exposure among young children. In Indonesia, 39.71% of early children use smartphones. In East Nusa Tenggara, the prevalence reached 44.69% in urban and 34.76% in rural areas. Excessive screen time is associated with reduced parent-child interaction, poor self-regulation, and delayed personal social skills. This study aimed to analyze the correlation between screen time duration and personal-social development of children aged 2-5 years in Kupang. A quantitative cross-sectional correlational design was applied to 60 respondents selected through consecutive sampling. Screen time duration was measured using a modified and validated version of the Surveillance of Digital Media Habits in Early Childhood Questionnaire (SMALLQ; Cronbach's Alpha = 0.875) and categorized as normal (≤60 minutes/day) or excessive (>60 minutes/day) based on recommendations from the Indonesian Pediatric Society. Personal social development was assessed using the Developmental Pre-Screening Questionnaire. Data were analyzed using the Chi-Square test and contingency coefficient ($\alpha = 0.05$). Ethical approval was obtained from the Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana (No.37/UN15.21/KEPK-FKKH/2025). The result showed that 31 (51.7%) had excessive screen time, and among them, 27 children (77.1%) demonstrated personal-social development that was not age-appropriate. A significant correlation was found ($p < 0.001$; $C = 0.517$), indicating a moderately strong relationship. These findings indicate that longer screen time exposure is significantly associated with a higher likelihood of delayed personal social development. Parental supervision and limiting screen time to a maximum of one hour per day are essential to support optimal developmental outcomes.

**Keywords:** Screen Time, Personal Social Development, Toddlers Aged 2–5 Years, Early Childhood Digital Exposure, Excessive Screen Use, Developmental Delays, Kupang.



## INTRODUCTION

The rapid growth of the digital era has substantially increased screen exposure among young children worldwide. In the United States, the use of tablets and smartphones among children rose sharply during the pandemic (McClain C., 2022). A similar trend is evident in Indonesia, where national socioeconomic statistics show that smartphone use among early childhood children increased from 33.44% in 2022 to 39.71% in 2024. Notably, East Nusa Tenggara (NTT)—a province characterized by geographical disparities and limited digital literacy—reported high exposure rates of 44.69% in urban and 34.76% in rural areas (Direktorat Statistik Kesejahteraan Rakyat, 2024). These patterns indicate that digital access is expanding even in regions with socioeconomic constraints, yet developmental

surveillance in such settings remains insufficiently studied.

Growing evidence suggests that excessive screen time may hinder toddlers' social interaction, self-regulation, and personal-social skill development (Gath *et al.*, 2025). National health surveillance reinforces this concern: only 43.2% of Indonesian children aged 1–59 months met developmental standards in 2023, and the proportion was even lower in NTT (42.0%), indicating substantial developmental vulnerability (Kementerian Kesehatan Republik Indonesia, 2023). However, previous studies present inconsistent results. While (Kartika *et al.*, 2022) found that prolonged screen time was associated with poorer personal-social outcomes, (Febriani *et al.*, 2024) reported no significant impact when parental supervision was present. These discrepancies highlight critical gaps in the literature, particularly regarding how screen time duration interacts with sociocultural contexts, parenting patterns, and environmental constraints in underrepresented regions.

Despite the rising digital exposure among toddlers in NTT, empirical studies examining its impact on early personal social development remain scarce. No prior research has specifically explored this association in Kupang, a city where digital adoption is rapidly increasing alongside persistent disparities in early childhood development. This study addresses this gap by analyzing the correlation between screen time duration and personal social development in toddlers aged 2-5 years in Kupang. The novelty of this research lies in providing population-specific evidence from an understudied region, offering new insights that can inform culturally relevant guidelines, strengthen parental education, and contribute to early childhood digital health policies in Indonesia.

## METHODOLOGY

This study employed a quantitative design with a cross-sectional correlational analytical approach to evaluate the relationship between screen time duration and personal-social development in toddlers. Data collection was conducted from July 16 to August 9, 2025, at the integrated service post (Pos Pelayanan Terpadu, Posyandu) within the working areas of community health centers (Pusat Kesehatan Masyarakat, Puskesmas) Sikumana and Tarus, Kupang, East Nusa Tenggara. All research procedures received ethical approval from the Health Research Ethics Committee of the Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana (No.37/UN15.21/KEPK-FKKH/2025) and were carried out in accordance with ethical guidelines for human subject research.

The study sample consisted of 60 toddlers aged 2-5 years recruited through consecutive sampling, including all subjects who met the inclusion criteria until the required sample size was reached. Inclusion criteria were toddlers aged 2-5 years with a history of screen time exposure based on parental reports and parents who agreed to participate and signed informed consent. Toddlers were excluded if they had a medical diagnosis of behavioural disorders, attention deficit hyperactivity disorder (ADHD), or pervasive developmental disorders such as autism, as confirmed by a doctor.

Screen time duration was measured using a locally adapted version of the Surveillance of Digital Media Habits in Early Childhood Questionnaire (SMALLQ) (Chia, 2018) which had been validated and reliability-tested in a preliminary study involving 30 respondents (Cronbach's Alpha = 0.875). Based on the 4recommendations of the Indonesian Pediatric Society, screen time was classified as normal (≤60 minutes/day) or excessive (>60 minutes/day). Personal-social development was assessed using the Developmental Pre-Screening Questionnaire (Kuesioner Pra Skrining Perkembangan, KPSP), a nationally standardized instrument widely used for early childhood developmental screening (Kementerian Kesehatan Republik Indonesia, 2022).

The research procedures were conducted systematically, beginning with an explanation of the study objectives to parents, verification of inclusion criteria, and obtaining informed consent. Structured interviews regarding screen time duration were then conducted with parents, followed by direct assessment of toddlers' personal-social development using age-appropriate KPSP protocols. All assessments were performed by trained researchers to ensure data consistency and reproducibility.

Statistical analysis included the Chi-Square test to determine the significance of the association between screen time duration and personal-social development, as well as the contingency coefficient to measure the strength of the relationship. The significance level was set at $\alpha = 0.05$, and all analyses were performed using the Jeffreys' Amazing Statistics Program (JASP).

## RESULT AND DISCUSSION

In this study, a total of 60 children aged 2 to 5 years were recruited. The most common gender of children was female (56.7%) and the majority child were aged between 3-4 and 4-5 years (38.3%). Most respondents were housewives (78.3%). When looking at the reasons for giving screen time, the most reported reason was to calm the child (36.7%), based on digital media usage supervision, most children are only sometimes accompanied when using digital media (36.7%), and the most watched type of content was entertainment videos (81.7%).

**Table 1: Frequency Distribution of Research Characteristics the Relationship Between Screen Time and Personal Social Development in Kupang**

| Characteristics | Frequency (n) | Percentage (%) |
|---|---|---|
| **Child's Gender** | | |
| Male | 26 | 43,3 |
| Female | 34 | 56,7 |
| **Child's Age** | | |
| 2-3 Year | 23 | 38,3 |
| 3-4 Year | 23 | 38,3 |
| 4-5 Year | 14 | 23,3 |
| **Respondent's Occupation** | | |
| Housewife | 47 | 78,3 |
| Farmer | 6 | 10,0 |
| Privat sector employee | 6 | 10,0 |
| Teacher | 1 | 1,7 |
| **Reasons for Giving Screen Time** | | |
| To encourage children to eat | 14 | 23,3 |
| To calm children | 22 | 36,7 |
| As an education tool | 5 | 8,3 |
| To entertain children | 18 | 30,0 |
| To help children fall asleep | 1 | 1,7 |
| **Digital Media Usage Supervision** | | |
| Always | 22 | 36,7 |
| Sometime | 22 | 36,7 |
| Unaccompanied | 16 | 26,7 |
| **Type of Content Watched** | | |
| Game online | 5 | 8,3 |
| Education videos | 6 | 10,0 |
| Entertainment videos | 49 | 81,7 |
| **Screen Time Duration** | | |
| Normal | 29 | 48,3 |
| 2-3 Year | 15 | 51,7 |
| 3-4 Year | 10 | 34,5 |
| 4-5 Year | 4 | 13,8 |
| Excessive | 31 | 51,7 |
| 2-3 Year | 8 | 25,8 |
| 3-4 Year | 13 | 41,9 |
| 4-5 Year | 10 | 32,3 |
| **Personal Social Development** | | |
| Appropriate | 25 | 41,7 |
| Not appropriate | 35 | 58,3 |
| **Total** | **60** | **100,0** |

Table 1 indicates that 29 toddlers (48.3%) were categorized as having a normal duration of screen time, consisting of 15 children aged 2-3 years, 10 children aged 3-4 years, and 4 children aged 4-5 years. In contrast, excessive screen time was identified in 31 toddlers (51.7%), including 8 children aged 2-3 years, 13 children aged 3-4 years, and 10 children aged 4-5 years. Regarding personal social development, 35 toddlers (58.3%) demonstrated development that was not appropriate for their age, whereas 25 toddlers (41.7%) showed age-appropriate personal social development. Overall, these results indicate that a considerable proportion of toddlers in the study experienced delays in personal social development.

**Table: 2 Bivariate Analysis**

| Screen Time Duration | Personal Social Development | | | | | C* | P** value |
|---|---|---|---|---|---|---|---|
| | Appropriate | | Not Appropriate | | Total | | |
| | n | % | n | % | | | |
| **Normal** | 21 | 84,0 | 8 | 22,9 | 29 | 0,517 | <0,001 |
| **Excess** | 4 | 16,0 | 27 | 77,1 | 31 | | |
| **Total** | 25 | 100 | 35 | 100 | 60 | | |

*Contingency Coefficient
**Uji Chi Square, p<0,05

The findings of this study demonstrate a significant association between screen time duration and personal social development among toddlers aged 2-5 years. The Chi-square analysis ($p < 0.001$), supported by a moderate contingency coefficient ($C = 0.517$), indicates that excessive screen exposure is correlated with less favorable personal social developmental outcomes. A substantial proportion of toddlers with excessive screen time exhibited non–age-appropriate development, whereas most children with normal screen time demonstrated age-appropriate personal social skills. These findings are consistent with previous studies reporting associations between prolonged screen exposure and reduced social competence, peer engagement, and interactive behaviors in early childhood (Gath *et al.,* 2025; Rezaeian *et al.,* 2025). Collectively, this body of evidence suggests that reduced opportunities for real-world social interaction may represent a key pathway linking excessive screen use to suboptimal social development.

The observed associations may be partly explained by neurocognitive mechanisms described in experimental and longitudinal research. Excessive exposure to fast-paced digital content can overstimulate attentional systems and disrupt the balance between bottom-up and top-down attention processes. High-intensity audiovisual stimuli predominantly activate bottom-up attention, which is driven by novelty and sensory salience, while the top-down regulatory system—dependent on the still-developing prefrontal cortex—remains immature in early childhood. This imbalance may impair sustained attention, self-regulation, and impulse control (Katsuki & Constantinidis, 2016).

In addition, rapid digital stimuli also activate the mesolimbic dopaminergic pathway, particularly from the Ventral Tegmental Area (VTA) to the Nucleus Accumbens (NAc), regions central to reward processing and motivation. Each change in image, sound, or movement triggers dopamine release, producing an "instant reward" response that reinforces reward-seeking behaviour (Miller & Cohen, 2016). Repeated activation may cause children to become increasingly dependent on fast-paced stimuli, while weakening neural connectivity between the prefrontal cortex and striatal regions critical for self-regulation. Over time, this imbalance of the reward system and the control system, making it more difficult for children to delay gratification and manage behaviour (Swider-Cios *et al.,* 2023).

The combined effects of attentional overstimulation and dopaminergic hyperactivation directly influence executive function, self-regulation, and social behaviour. Children may become more distractible, impulsive, struggle to maintain focus, and show limited ability to wait their turn or engage reciprocally with peers. In the long term, these behavioral patterns may limit opportunities to practice empathy, cooperation, and emotional regulation, thereby impeding personal social development (Fan *et al.,* 2021). Supporting this neurobiological model, a JAMA Pediatrics study reported altered white matter integrity in brain regions responsible for attention and emotion regulation among children with high screen exposure (Hutton *et al.,* 2020). Similarly, (Namazi & Sadeghi, 2024) found that fast-paced entertainment content repeatedly activates the reward system without strengthening self-control, resulting in greater impulsivity and diminished social competence.

Beyond the neurocognitive mechanisms described above, the broader developmental implications of excessive screen time exposure must also be considered. Early childhood personal social development plays a fundamental role in forming social competence and emotional regulation capacity that will influence throughout life (Wang & Liu, 2025). During the preschool period, direct interaction with caregivers and peers serves as the primary context for acquiring essential social skills, including sharing, cooperation, and interpreting social cues. Adequate social stimulation during ages 2–5 years has been associated with improved school readiness, including improved attention control, impulse regulation, cognitive flexibility, early executive function, and adaptation to the early learning environment (e.g., readiness for formal education) (Korucu *et al.,* 2022). Furthermore, in school-age childhood, personal social competence has been shown to mediate academic achievement and mental well-being, with socially competent children demonstrating better academic performance and fewer emotional or behavioural difficulties (Sun *et al.,* 2025).

The observed correlation between screen time duration and personal social development underscores the potential importance of early media exposure patterns in shaping children's social functioning. From a practical perspective, these findings highlight the need for early guidance to parents and caregivers regarding age-appropriate screen use, particularly in encouraging active supervision and promoting direct social interaction during early childhood. At the population level, the results may inform community-based health education programs and early childhood development policies aimed at fostering balanced digital media use.

However, although this study provides important insights into the relationship between screen time duration and personal social development in early childhood, the findings should be interpreted within the context of the study design and methodological constraints. Given the cross-sectional design of this study, causal relationships cannot be inferred, and the observed associations should be interpreted with caution.

## CONCLUSION

This study demonstrates a significant association between screen time duration and personal

social development among toddlers aged 2-5 years in Kupang. Excessive screen exposure was correlated with a higher prevalence of non–age-appropriate personal social development, highlighting screen time duration as an important correlate of early social functioning. These findings underscore the importance of structured limits on daily screen use, parental co-engagement during media consumption, and the promotion of enriched face-to-face social interactions. Early intervention strategies focused on fostering healthy media habits and strengthening caregiver–child interactions may play a critical role in supporting optimal personal–social development during early childhood.

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