

Screen time and behavioral, psychosocial, and emotional problems among elementary school children in the context of the “brain rot” phenomenon

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ABSTRACT

The rapid advancement of digital technology has transformed the daily activities of elementary school children. Excessive screen time may be associated with reduced attention and cognitive engagement, with potential implications for behavioral, psychosocial, and emotional well-being. This study examined the association between screen time and indicators of behavioral, psychosocial, and emotional problems among elementary school children. An analytic cross-sectional study was conducted at a public elementary school in Surabaya, Indonesia, involving 147 children selected using stratified one-stage cluster sampling. Screen time was assessed with a questionnaire, and behavioral, psychosocial, and emotional problems were measured with the Pediatric Symptom Checklist-17 (PSC-17). Associations were analyzed using Fisher's exact test. Of the participants, 120 (81.6%) owned a personal mobile phone. One hundred children (68.0%) reported screen time of less than two hours per day, while 47 (32.0%) reported two hours or more per day. Higher screen time was significantly associated with internalizing, attention, and externalizing problems, as well as overall PSC-17 problem indicators ($p < 0.05$). These findings suggest that greater screen time is associated with a higher prevalence of behavioral, psychosocial, and emotional problem indicators among elementary school children. Parental supervision and age-appropriate limits on digital device use may help support children's mental health and healthy development.

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1. Introduction

Rapid technological advancement has made digital devices integral to children's education, entertainment, and social interaction [1]. Screen time is defined as time spent using devices such as smartphones, tablets, computers, and televisions [2]. can provide benefits when appropriately managed; however, excessive use has been associated with obesity, sleep disruption, reduced physical activity, and poorer mental well-being [3]. More recently, concerns have emerged around “brain rot,” a popular term describing perceived declines in cognitive engagement and well-being associated with prolonged exposure to low-quality digital content [4,5]. Although not a clinical diagnosis and not directly measured in this study, the concept has been linked to poor concentration,

anxiety when separated from devices, cognitive overload, emotional desensitization, and symptoms of anxiety and depression [6,7]. These concerns may be particularly relevant to Generation Alpha, who have experienced extensive digital exposure from an early age [8].

Screen use among school-aged children is substantial. Children aged 6–14 years reportedly spend approximately 4.5–4.6 hours per day on screens [9], while one study found that 67.15% of fourth- to sixth-grade students used digital devices for 2–3 hours daily and 57.66% were at risk of device addiction [10]. These patterns exceed several international recommendations. The American Academy of Pediatrics recommends limiting noneducational screen use among children aged 6–12 years [11], while Canadian and Chinese guidelines generally recommend no more than 2 hours of recreational screen time per day [12,13].

Elementary school children may be particularly vulnerable because they are undergoing important cognitive, emotional, and social development. Family relationships and characteristics can also shape children's digital experiences and psychosocial well-being [14,15]. The Pediatric Symptom Checklist-17 (PSC-17) provides a standardized screening tool for children aged 4–17 years and assesses three domains: internalizing, attention, and externalizing problems [16].

Previous studies have linked digital overstimulation to reduced sustained attention and difficulty transitioning to conventional learning activities [17]. However, evidence examining daily screen time alongside standardized psychosocial screening remains limited, particularly among Indonesian elementary school children. This study therefore aimed to examine the association between screen time and indicators of internalizing, attention, externalizing, and overall behavioral, psychosocial, and emotional problems, as measured by the PSC-17. The study is positioned within the emerging “brain rot” discourse while treating the term as a contextual concept rather than a measured clinical construct.

2. Method

2.1. Research design

This analytic observational study used a cross-sectional design [18] and was conducted at a public elementary school in Surabaya from January to March 2026. The school was selected following a preliminary survey indicating early access to digital devices among students from predominantly lower-middle-income families. Ethical approval was obtained from the Ethics Committee of the Faculty of Medicine, Universitas Wijaya Kusuma Surabaya (No. 1/SLE/FK/UWKS/2026).

2.2. Participants and Eligibility Criteria

Eligible participants were students aged 6–13 years who used electronic devices, had parental permission, agreed to participate, and provided complete responses. Children with physical or mental health conditions, or those unable to participate cooperatively, were excluded.

2.3. Sample Size and Sampling

The minimum sample size was calculated using the formula:

$$n = \frac{Z_{\alpha/2}^2 \times P \times (1 - P) \times D}{E^2}$$

where $Z_{(\alpha/2)} = 1.96$, $P = 0.50$, $E = 0.10$, and the design effect $D = 1.5$, yielding a minimum sample of 145 participants [19].

A stratified one-stage cluster sampling technique was used. Grade levels 1–6 were treated as strata, each comprising three classes, resulting in 18 clusters. One class from each grade was randomly selected using a computerized randomization procedure: 1A, 2A, 3B, 4B, 5C, and 6A. All

eligible students in the selected classes were invited to participate, resulting in a final sample of 147 students. Classes served as sampling clusters, while individual students were the units of analysis.

2.4. Research Instrument

Screen time was assessed using a questionnaire adapted from Hu et al. [13] and categorized as <2 hours/day or ≥ 2 hours/day. Behavioral, psychosocial, and emotional problems were assessed using the Indonesian version of the Pediatric Symptom Checklist-17 (PSC-17), which has been previously validated in Indonesia. Each item was scored 0 (*never*), 1 (*sometimes*), or 2 (*often*). A total PSC-17 score ≥ 15 indicated a positive overall screen, while subscale cut-offs were ≥ 5 for internalizing problems and ≥ 7 for attention and externalizing problems [18].

2.5. Data collection

Parents received instructions from the research team and a pediatrician on how to complete the PSC-17 to standardize questionnaire administration. Study information and questionnaires were distributed through coordination with the school. Informed consent, screen-time data, and PSC-17 responses were then collected from eligible participants and their parents or guardians. Screen time was treated as the independent variable, while PSC-17 overall and subscale indicators were the dependent variables.

2.6. Data analysis

Data were entered in Microsoft Excel and analyzed using SPSS version 27.0. Descriptive statistics were used to summarize participant characteristics, screen-time exposure, and PSC-17 outcomes. Associations between screen time and overall as well as domain-specific PSC-17 indicators were examined using Fisher's exact test because several expected cell frequencies were below five. Individual students were treated as the units of analysis; clustering within classes was not statistically adjusted. Statistical significance was set at $p < 0.05$.

3. Results and Discussion

3.1. Results

The characteristics of the respondents can be shown in Table 1.

Table 1. Characteristics of Children at a Public Elementary School in Surabaya

Variable	Category	Frequency (f)	Percentage (%)
Gender	Male	71	48.3
	Female	76	51.7
	6	1	0.7
	7	18	12.2
Age (Years)	8	23	15.6
	9	20	13.6
	10	27	18.4
	11	25	17.0
	12	27	18.4
	13	6	4.1
	1	23	15.6
Class	2	22	15.0
	3	27	18.4
	4	24	16.3
	5	23	15.6
	6	28	19.0
	None	8	5.4
	Hand-phone	120	81.6
Device	Television	74	50.4
	Computer/laptop	10	6.8
	Tablet/iPad	10	6.8

*Participants may have reported more than one type of device.

The study included 147 elementary school children from a public school in Surabaya, East Java, Indonesia. Participants represented grades 1–6 and had varying levels of access to digital devices. As shown in Table 1, 76 participants (51.7%) were female. The largest age groups were ages 10 and 12, each comprising 27 children (18.4%), while sixth-grade students represented the largest grade group (19.0%). Most children (81.6%) owned or used a personal mobile phone.

Table 2. Distribution of Screen Time for Children at a Public Elementary School in Surabaya

Screen time	Frequency (f)	Percentage (%)
Low (<2 hours)	100	68
High (≥2 hours)	47	32
Total	147	100

Most participants (68.0%) reported screen time of less than 2 hours per day, whereas 47 children (32.0%) reported screen time of 2 hours or more per day (Table 2).

Table 3. Distribution of Behavioral, Psychosocial, and Emotional Problem Indicators in Children at a Public Elementary School in Surabaya

Variable	Category	Frequency (f)	Percentage (%)
Indicators of Internalizing Problems	Yes	10	6.8
	No	137	93.2
Indicators of Attention Problems	Yes	4	2.7
	No	143	97.3
Indicators of Externalizing Problems	Yes	9	6.1
	No	138	93.9
Indicators of Behavioral, Psychosocial, and Emotional Problems	Yes	7	4.8
	No	140	95.2

Positive PSC-17 screening results were relatively uncommon (Table 3). Internalizing problem indicators were identified in 10 children (6.8%), externalizing problem indicators in 9 (6.1%), attention problem indicators in 4 (2.7%), and overall behavioral, psychosocial, and emotional problem indicators in 7 (4.8%).

Higher screen time was significantly associated with all PSC-17 problem domains (Table 4). Among children with screen time ≥2 hours/day, 8 of 47 screened positive for internalizing problems compared with 2 of 100 children with lower screen time (PR 8.51; 95% CI 1.88–38.53; $p = 0.002$). Externalizing problems were also more common in the higher screen-time group (8/47 vs. 1/100; PR 17.02; 95% CI 2.19–132.19; $p < 0.001$). All positive screens for attention problems (4/47) and overall behavioral, psychosocial, and emotional problems (7/47) occurred among children with higher screen time; therefore, prevalence ratios could not be estimated because no cases occurred in the lower screen-time group.

Table 4. Association Between Screen Time and Behavioral, Psychosocial, and Emotional Problem Indicators in Children at a Public Elementary School in Surabaya

Variable	Category	Yes (n, %)	No (n, %)	PR (95% CI)	P-value
Indicators of Internalizing Problems	High	8 (5.4)	39 (26.5)	8.51 (1.88–38.53)	0.002
	Low	2 (1.4)	98 (66.7)		
Indicators of Attention Problems	High	4 (2.7)	43 (29.3)	Not estimable	0.010
	Low	0 (0)	100 (68)		
Indicators of Externalizing Problems	High	8 (5.4)	39 (26.5)	17.02 (2.19–132.19)	< 0.001
	Low	1 (0.7)	99 (67.3)		
Indicators of Behavioral, Psychosocial, and Emotional Problems	High	7 (4.8)	40 (27.2)	Not estimable	< 0.001
	Low	0 (0)	100 (68)		

Overall, Fisher's exact tests showed significant associations between higher screen time and internalizing ($p = 0.002$), attention ($p = 0.010$), externalizing ($p < 0.001$), and overall PSC-17 problem indicators ($p < 0.001$).

3.2. Discussion

Previous studies suggest that earlier personal mobile phone ownership may be associated with poorer mental and emotional health later in life, prompting recommendations to delay ownership until adolescence [19]. As digital devices become increasingly integrated into education, communication, and entertainment, screen exposure among children continues to rise. Excessive screen use has been associated with reduced physical activity, poorer attention, and behavioral and emotional difficulties [7,20–22]. In this context, the emerging “brain rot” discourse reflects concerns about prolonged exposure to low-quality digital content and its possible implications for cognitive engagement and emotional regulation, although it is not a clinical construct [23].

In this study, children with higher screen time were more likely to screen positive for internalizing, attention, and externalizing problems, as well as for overall behavioral, psychosocial, and emotional problem indicators. These findings are consistent with previous research linking prolonged digital media use to poorer attention, emotional regulation, anxiety, depressive symptoms, and aggressive behavior [24,25]. One possible explanation is that prolonged screen use may displace activities important for healthy development, including physical activity, face-to-face interaction, sleep, and cognitively stimulating experiences. Continuous digital stimulation may also contribute to cognitive overload, distractibility, and emotional fatigue [6,26,27].

Nevertheless, most participants did not screen positive for psychosocial or emotional problems. These relatively low proportions should be interpreted cautiously. The PSC-17 relied on parent reports, which may not fully capture symptoms expressed primarily at school or in peer settings [28]. Cultural differences in the recognition of behavioral and emotional problems may also influence reporting [29], while variation in PSC-17 norms across populations may affect screening classifications [30]. In addition, parental education, supervision, family environment, and socioeconomic conditions may influence both children's screen use and psychosocial well-being but were not assessed in this study [31–34].

Excessive digital device use has been associated with reduced face-to-face interaction and difficulties with emotional and behavioral regulation. Previous studies have linked prolonged screen use with anxiety and depressive symptoms, poorer attention and concentration, reduced self-regulation, and more aggressive behavior among school-age children [26,35,36]. Although most participants in this study did not screen positive for behavioral or emotional problems, parental supervision, positive parenting, and supportive school environments remain important for protecting children's psychosocial well-being.

Consistent with previous research, this study found that higher screen time was associated with a greater presence of behavioral, psychosocial, and emotional problem indicators [37]. Excessive screen exposure has also been associated with poorer language, social, and cognitive development and greater risk of problematic digital use [21,22,38]. These findings support the importance of balanced digital use alongside adequate physical activity, sleep, and social interaction. Parents and educators should therefore monitor both the duration and context of children's screen use [39–43].

This study has several limitations. The screen-time measure was adapted from a previous study but was not independently validated in this sample, while the psychometric properties of the Indonesian PSC-17 were not reassessed. Reliance on parent-reported questionnaires may have introduced recall and social desirability bias, and screen use was not objectively verified. The cross-sectional design precludes causal inference, and recruitment from a single public elementary school limits generalizability. Potential confounders, including digital-content type, parental supervision,

parenting practices, family support, socioeconomic status, sleep, and physical activity, were not assessed. Finally, clustering of students within classes was not accounted for, which may have affected the precision of the estimates. Future studies should use longitudinal designs, objective measures of screen exposure, broader assessment of confounders, and cluster-adjusted analyses.

4. Conclusion

This study found that higher screen time was significantly associated with a greater presence of behavioral, psychosocial, and emotional problem indicators among elementary school children, including internalizing, attention, and externalizing problems. Although most children did not screen positive for these problems, the findings suggest that greater screen exposure may represent an important factor to consider in efforts to support children's mental and psychosocial well-being. Parents and schools should therefore promote balanced and age-appropriate digital-device use, alongside adequate physical activity, sleep, face-to-face interaction, and supportive supervision. Future longitudinal studies are needed to clarify the direction and persistence of these associations over time. Further research should also examine not only screen duration, but also the type, quality, and purpose of digital content, as these factors may influence children's developmental outcomes differently.

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Author contributions

IWRJP contributed to the development of the questionnaire, data collection, data processing, and the drafting and revision of the manuscript. AS contributed to research supervision, provided instructions for completing the instrument, and conducted a scientific review of the manuscript. NK contributed to the methodological validation and verification of the data processing results. WDP contributed to the final preparation of the manuscript.

Conflict of Interest

No potential conflict of interest was reported by the authors.

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