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SCREEN TIME AND BEHAVIORAL PROBLEMS IN PRESCHOOL CHILDREN: A CROSS-SECTIONAL STUDY

Original Article

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ABSTRACT

Background: Excessive screen exposure among preschool children has emerged as a critical public health concern, with growing evidence linking it to adverse behavioral outcomes. As digital media becomes increasingly integrated into early childhood routines, its influence on emotional regulation, attention span, and sleep patterns warrants further exploration, particularly in low- and middle-income regions.

Objective: To evaluate the association between daily screen time duration and behavioral issues—specifically irritability, attention problems, and sleep disturbances—in children aged 2 to 5 years.

Methods: A cross-sectional study was conducted over eight months across pediatric outpatient and early childhood centers in urban Pakistan. A total of 310 children aged 24 to 60 months were included through convenience sampling. Data on screen exposure were collected via caregiver-reported questionnaires. Behavioral assessments included the Affective Reactivity Index (ARI), Strengths and Difficulties Questionnaire (SDQ) for attention, and Children's Sleep Habits Questionnaire (CSHQ). Data were analyzed using ANOVA, Pearson correlation, and multivariate regression, with significance set at $p<0.05$.

Results: Screen time exceeding two hours daily was significantly associated with higher behavioral symptom scores. Mean ARI, SDQ, and CSHQ scores increased with longer screen exposure. Pearson's correlation showed positive relationships between screen time and irritability ($r=0.62$), inattention ($r=0.58$), and sleep disturbances ($r=0.64$). Regression analyses confirmed screen time as an independent predictor of all three behavioral outcomes ($p<0.001$).

Conclusion: Excessive screen time is significantly linked with increased irritability, attention problems, and sleep disturbances in preschool-aged children. These findings underscore the importance of limiting screen exposure during early development and informing caregivers about screen-related behavioral risks.

Keywords: Attention Deficit, Behavior, Child Preschool, Cross-Sectional Studies, Irritability, Sleep Wake Disorders, Television, Time Factors.

INTRODUCTION

The pervasive integration of digital devices into daily life has significantly altered the developmental landscape for young children. In an era where screens are used not only for entertainment but also as educational tools and behavioral regulators, the implications of prolonged screen exposure during the formative years warrant careful scrutiny (1). Among preschool-aged children, a group undergoing rapid cognitive, emotional, and social development, excessive screen time has emerged as a growing public health concern. While digital technology offers various benefits, including early learning opportunities and exposure to multimedia content, mounting evidence suggests that excessive or unregulated screen use may negatively impact behavior and overall well-being in this vulnerable age group (2,3). Several studies have noted correlations between screen time and a range of behavioral problems, including irritability, decreased attention span, and disturbances in sleep patterns (4). The American Academy of Pediatrics (AAP) recommends limiting screen time for children aged 2 to 5 years to no more than one hour per day of high-quality programming. However, real-world adherence to these guidelines appears inconsistent, with recent surveys indicating that many preschoolers exceed these limits regularly. This deviation raises critical concerns regarding the developmental cost of screen overexposure at such a pivotal life stage (5,6).

Behavioral health in early childhood sets the foundation for later emotional regulation, academic achievement, and interpersonal skills. Emerging evidence suggests that excessive screen use may hinder these domains by promoting passive interaction, displacing physical activity, disrupting sleep hygiene, and reducing time for meaningful social engagement (7). For instance, longitudinal findings have linked increased screen exposure in early childhood with attention-deficit and hyperactivity-related behaviors in later years (8). Furthermore, screens, particularly when used close to bedtime, have been shown to interfere with melatonin production and sleep quality, potentially leading to mood dysregulation and behavioral disturbances the following day. Although the relationship between screen time and child behavior is complex and influenced by numerous factors such as parental mediation, screen content, and socio-economic status, the existing literature underscores the urgency of better understanding this association (9,10). Many existing studies rely on retrospective or self-reported data, and few focus specifically on preschool-aged children using objective behavioral assessment tools. Moreover, most research does not simultaneously examine a cluster of behavioral symptoms—namely irritability, attention problems, and sleep disturbances—which often co-occur and may collectively signal broader emotional and regulatory challenges (11-13).

In light of these limitations, this study seeks to evaluate the association between daily screen time and behavioral problems, particularly irritability, attention difficulties, and sleep disturbances, in children aged 2 to 5 years. By focusing on this critical developmental window and employing a cross-sectional design, the study aims to contribute nuanced insights into how screen use may influence early childhood behavior. Through this research, a more comprehensive understanding may be attained, informing evidence-based guidelines for parents, educators, and healthcare providers concerned with fostering healthy developmental outcomes in young children. The primary objective of the study is to assess whether increased daily screen time is significantly associated with higher levels of irritability, attentional issues, and sleep disturbances among preschool children.

METHODS

This cross-sectional study was conducted over an 8-month period in various pediatric outpatient departments and early childhood development centers located in urban and semi-urban areas of Lahore and Islamabad, Pakistan. These settings were selected to ensure a diverse representation of socio-economic backgrounds, capturing a broader view of early childhood behavioral trends in relation to screen exposure. The objective was to evaluate the association between daily screen time and behavioral issues—specifically irritability, attention difficulties, and sleep disturbances—among children aged 2 to 5 years. Participants were recruited through non-probability convenience sampling, targeting parents and caregivers who brought their children for routine pediatric visits or enrolled them in preschool programs. Inclusion criteria specified healthy children aged 24 to 60 months, residing with primary caregivers, and free from diagnosed neurodevelopmental or psychiatric disorders. Children with known developmental delays, chronic neurological illnesses, or those on regular psychotropic medication were excluded to avoid confounding influences on behavior (4,5). Informed consent was obtained in writing from all participating parents or guardians after explaining the study's purpose, procedures, and confidentiality safeguards. The sample size was determined using the OpenEpi calculator for cross-sectional studies, assuming an anticipated behavioral problem prevalence of 25% among preschoolers with high screen time, a 95% confidence level, and a 5% margin of error. The required sample size was calculated to be 289 participants. To account for potential dropouts and incomplete data, a final sample size of 310 children was targeted.

Data collection was performed using a structured, interviewer-administered questionnaire filled out by caregivers. The questionnaire was divided into three main sections: demographic details, screen time habits, and behavioral assessment. Screen time duration was measured by querying the average daily exposure to screens (TV, smartphones, tablets, computers) over the past month, categorized into four groups: <1 hour, 1–2 hours, 2–3 hours, and >3 hours per day. Behavioral issues were assessed using standardized and validated instruments. Irritability was measured through the Affective Reactivity Index (ARI), a caregiver-reported scale that evaluates emotional reactivity and anger intensity (14). Attention problems were evaluated using the Strengths and Difficulties Questionnaire (SDQ) hyperactivity/inattention subscale, a tool frequently employed in child behavioral research with proven reliability in the Pakistani context. Sleep disturbances were assessed using the Children's Sleep Habits Questionnaire (CSHQ), which captures aspects such as bedtime resistance, sleep onset delay, and night awakenings (15). All instruments were translated into Urdu and pretested on a pilot group of 20 participants to ensure clarity and cultural relevance. Any ambiguities identified during the pilot phase were addressed through linguistic adjustments under the guidance of bilingual pediatric psychologists.

Data were entered and analyzed using IBM SPSS Statistics version 26. Descriptive statistics were generated to summarize demographic data, screen time exposure, and behavioral scores. The normality of continuous variables was assessed using the Shapiro-Wilk test, and all outcome variables were confirmed to be normally distributed. Therefore, parametric tests were employed. Analysis of variance (ANOVA) was used to compare mean behavioral scores across the four screen time categories. Pearson's correlation coefficient was used to examine the strength of associations between total daily screen time and each behavioral domain (irritability, attention, and sleep). Multiple linear regression analyses were then conducted to adjust for potential confounding variables, including age, gender, parental education, household income, and number of siblings. Ethical approval for the study was obtained from the Institutional Review Board (IRB) of the relevant institute. All procedures adhered to the ethical principles outlined in the Declaration of Helsinki. Confidentiality of participants was strictly maintained, and identifiable information was not linked to the study database. Caregivers retained the right to withdraw at any stage without prejudice. This comprehensive methodological approach was structured to ensure reliable, culturally appropriate, and replicable findings concerning the influence of screen time on behavioral outcomes in Pakistani preschoolers.

RESULTS

The final sample comprised 310 children aged between 24 to 60 months, with a mean age of 42.3 months. Slightly more than half (54.2%) were male, and 67.1% resided in urban settings. A majority of caregivers (60.4%) had attained at least a bachelor's degree, and 48.6% of households reported monthly incomes exceeding PKR 50,000. Screen time distribution showed that 20.0% of children had less than 1 hour of screen time daily, 31.6% had 1–2 hours, 27.4% had 2–3 hours, and 21.0% exceeded 3 hours. There was a graded increase in behavioral symptom scores with increasing screen exposure. Mean irritability scores measured by the Affective Reactivity Index (ARI) rose from 2.1 ± 1.3 in the <1 hour group to 5.3 ± 2.0 in the >3 hours group. Similarly, mean scores for attention problems on the SDQ inattention subscale increased from 3.2 ± 1.1 to 6.2 ± 1.9 across the same screen time spectrum. Sleep disturbance scores, assessed via the Children's Sleep Habits Questionnaire (CSHQ), followed the same trend, with scores increasing from 36.5 ± 4.2 in the lowest screen time category to 45.0 ± 5.8 in the highest. Pearson's correlation coefficients indicated moderate to strong positive relationships between total daily screen time and behavioral outcomes. The correlation with ARI scores was $r = 0.62$ ($p < 0.001$), with SDQ inattention scores $r = 0.58$ ($p < 0.001$), and with CSHQ sleep disturbance scores $r = 0.64$ ($p < 0.001$), all suggesting statistically significant associations. Multiple linear regression analysis, adjusting for potential confounders such as child age, gender, parental education, household income, and number of siblings, further substantiated these findings. Screen time was independently associated with higher ARI scores ($\beta = 0.87$; 95% CI: 0.71–1.03; $p < 0.001$), SDQ inattention scores ($\beta = 0.75$; 95% CI: 0.59–0.91; $p < 0.001$), and CSHQ scores ($\beta = 1.12$; 95% CI: 0.94–1.30; $p < 0.001$). These findings reflect a clear trend: greater screen exposure was significantly linked with elevated levels of irritability, attentional difficulties, and sleep disturbances among preschool-aged children in the studied population.

Table 1: Demographic Characteristics of the Study Population (N = 310)

Characteristic	Value
Mean Age (months)	42.3
Male (%)	54.2
Female (%)	45.8
Urban Residence (%)	67.1
Parental Education ≥ Bachelor's (%)	60.4
Household Income > PKR 50,000 (%)	48.6

Table 2: Distribution of Screen Time Among Participants

Screen Time Category	Number of Children (n)	Percentage (%)
<1 hour	62	20.0
1–2 hours	98	31.6
2–3 hours	85	27.4
>3 hours	65	21.0

Table 3: Mean Behavioral Scores by Screen Time Category

Screen Time Category	ARI (Irritability) Mean ± SD	SDQ Inattention Mean ± SD	CSHQ Sleep Disturbance Mean ± SD
<1 hour	2.1 ± 1.3	3.2 ± 1.1	36.5 ± 4.2
1–2 hours	3.0 ± 1.5	4.0 ± 1.3	38.8 ± 4.5
2–3 hours	4.0 ± 1.8	5.1 ± 1.6	41.2 ± 5.1
>3 hours	5.3 ± 2.0	6.2 ± 1.9	45.0 ± 5.8

Table 4: Correlation Between Screen Time and Behavioral Scores

Behavioral Domain	Pearson's r	p-value
ARI (Irritability)	0.62	<0.001
SDQ Inattention	0.58	<0.001
CSHQ Sleep Disturbance	0.64	<0.001

Table 5: Adjusted Regression Coefficients for Behavioral Outcomes

Outcome Variable	β Coefficient	95% CI	p-value
ARI Score	0.87	0.71–1.03	<0.001
SDQ Inattention	0.75	0.59–0.91	<0.001
CSHQ Sleep Disturbance	1.12	0.94–1.30	<0.001

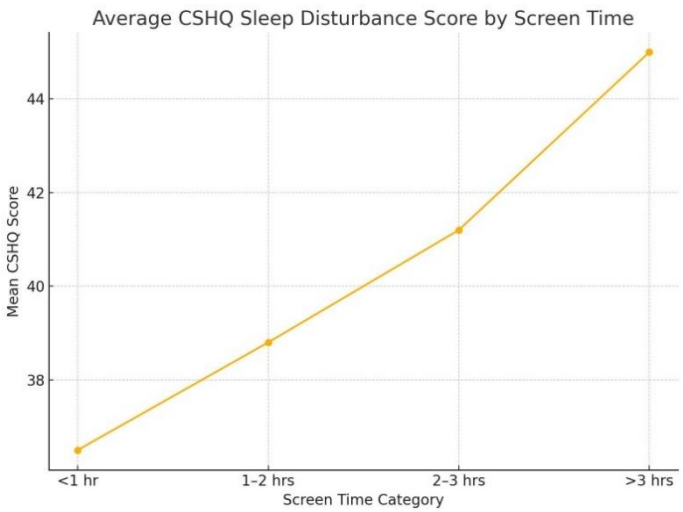

Figure 1 Average CSHQ Sleep Distribution Score by Screen Time

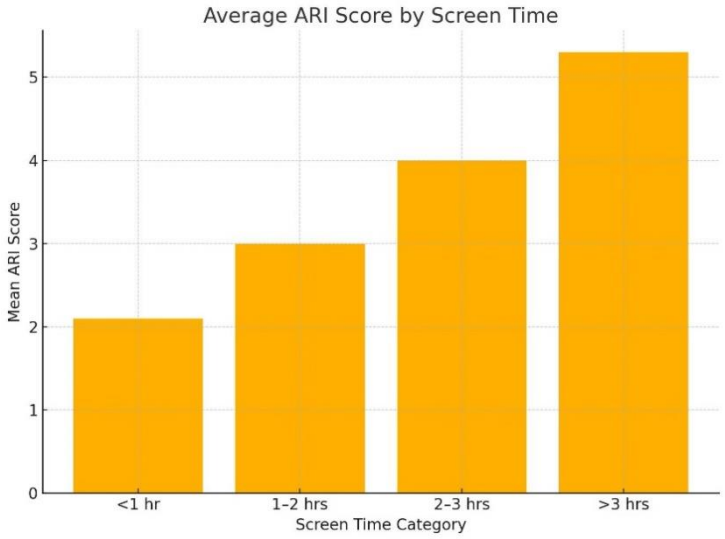

Figure 2 Average ARI Score by Screen Time

DISCUSSION

The present study adds to the growing body of literature exploring the impact of screen time on the behavioral health of preschool children. The results revealed a clear and significant association between increased screen exposure and elevated levels of irritability, attention difficulties, and sleep disturbances, aligning with a robust and consistent pattern observed in recent empirical studies. Several recent investigations support the findings of the current study. A study identified a strong dose-response relationship between screen time and a spectrum of behavioral problems, including inattention and sleep issues, with effects most pronounced in preschool-aged children (14,15). Similarly, a study found that children with excessive screen time exhibited significantly more behavioral challenges, including sleep difficulties, mood dysregulation, and parent-child relationship disruptions (16). This association remained robust even after adjusting for potential confounders such as socioeconomic status and parental screen habits. A comparable study reported excessive screen time in over half of the preschool children surveyed, which significantly correlated with emotional and behavioral disturbances and disrupted sleep patterns (17). In parallel, a study examining low-income populations found that excessive screen time independently predicted poorer sleep quality, frequent daytime fatigue, and greater difficulty falling asleep in young children (18). The mechanisms underlying these associations are multifaceted. A study demonstrated that screen use, particularly in the evening, disrupts circadian rhythms and sleep architecture, which in turn exacerbates behavioral regulation difficulties, such as hyperactivity and impulsivity (19). Moreover, observational research indicated that, high screen exposure correlates with both delayed sleep onset and impaired emotional self-regulation in children aged 4–6 years (20).

These findings collectively underscore the detrimental influence of excessive screen exposure on behavioral health in early childhood. However, this study carries certain strengths and limitations that merit attention. Among the strengths, the use of validated behavioral assessment tools such as the ARI, SDQ, and CSHQ enhanced the reliability of findings, and the consideration of potential confounders in multivariate analyses provided more refined estimates of associations. Nonetheless, the study is limited by its cross-sectional design, which precludes causal inference. Parental self-reporting may also introduce recall and social desirability biases. Furthermore, the content and context of screen exposure—factors known to influence behavioral outcomes—were not assessed in detail. As noted by a study, future research would benefit from using ecological momentary assessments and objective measures such as wearable devices to capture real-time behaviors and contextual screen use data (19,21). Additionally, while the study sampled a diverse socio-economic population from urban Pakistan, generalizability to rural or different cultural contexts remains limited. Longitudinal designs would be better suited to unravel the directionality and cumulative effects of screen exposure on behavioral development, as emphasized by longitudinal cohort studies, which have attempted to differentiate transient associations from long-term effects (22,23). In conclusion, the findings affirm the growing concern that prolonged screen exposure is associated with irritability, attentional problems, and sleep

disturbances in preschool-aged children. These results reinforce the need for public health strategies, caregiver education, and evidence-based guidelines to mitigate screen-related behavioral risks in early childhood.

CONCLUSION

This study concluded that increased daily screen time in preschool children is significantly associated with heightened irritability, attention difficulties, and sleep disturbances. These findings highlight the urgent need for early interventions, caregiver education, and policy measures to regulate screen exposure during early childhood, ensuring healthier developmental outcomes in this critical life stage.

AUTHOR CONTRIBUTION

Author	Contribution
Marhaba Rana*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Maryam Imad	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Saira Komal	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Sadaf Junejo	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Syeda Hadia Qudrat	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Mahak Ali	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Laiba Akhtar	Contributed to study concept and Data collection Has given Final Approval of the version to be published

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