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## Postprint of a Correlational Study on Screen Exposure and Emotional and Behavioral Problems in Preschool Children with Autism Spectrum Disorder

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### Abstract

**Background:** Previous studies have confirmed that screen exposure is prevalent among preschool children and is associated with emotional and behavioral problems. Existing research has primarily focused on typically developing preschool children, while studies investigating the association between screen exposure and emotional-behavioral problems in preschool children with autism are relatively scarce. **Objective:** To investigate the status of screen exposure and the detection rates of emotional-behavioral problems in preschool children with autism, and to explore the correlation between screen exposure and emotional-behavioral problems in this population. **Methods:** Preschool children with autism who met the diagnostic criteria for autism spectrum disorder according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) and visited the Department of Child Development and Behavior at the Third Affiliated Hospital of Zhengzhou University between February and August 2022 were selected as the autism group. During the same period, typically developing children from a kindergarten in Zhengzhou City were selected as the normal control group. The primary caregivers of children in both groups completed the Screen Exposure Questionnaire and the Strengths and Difficulties Questionnaire (Parent Version). **Results:** The two groups differed significantly in screen contact time, parental screen management, and responses to “screen deprivation” ( $P < 0.001$ ). The autism group exhibited higher abnormal detection rates than the normal control group in prosocial behavior, total difficulties score, and all sub-dimensions (emotional symptoms, conduct problems, hyperactivity/attention deficit problems, peer relationship problems) ( $P < 0.001$ ). Logistic regression analysis identified the following as influencing factors for emotional-behavioral problems in preschool children with ASD: placement of electronic devices in sleeping or play areas, whether care-

givers provided interactive explanations during viewing, caregivers' attitudes toward children' s screen use, whether screen contact was actively requested or passively participated in, and children' s reactions to forced screen shutdown ( $P < 0.05$ ). Conclusion: Screen exposure can impact emotional-behavioral problems in children with autism, and parents should reasonably manage screen use in preschool children with autism.

## Full Text

### Association Between Screen Exposure and Emotional and Behavioral Problems in Preschool Children with Autism Spectrum Disorder

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## Abstract

**Background:** Previous studies have confirmed that screen exposure is widespread among preschool children and is associated with emotional and behavioral problems. However, most existing research has focused on typically developing preschool children, while studies examining screen exposure and emotional/behavioral problems in preschool children with autism are relatively scarce.

**Objective:** To investigate screen exposure patterns and the prevalence of emotional and behavioral problems in preschool children with autism spectrum disorder (ASD), and to explore the association between screen exposure and these problems.

**Methods:** Preschool children with autism who met the diagnostic criteria for autism according to the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-V) and visited the Department of Child Development and Behavior at the Third Affiliated Hospital of Zhengzhou University between February and August 2022 were selected as the autism group. Concurrently, typically developing children from kindergartens in Zhengzhou were selected as the normal control group. The main caregivers of children in both groups completed a screen exposure questionnaire and the Strengths and Difficulties Questionnaire (parent version).

**Results:** Significant differences were observed between the two groups in screen contact time, parental screen management, and responses to "screen deprivation" ( $P < 0.001$ ). The autism group showed significantly higher abnormal detection

rates than the control group in prosocial behavior, total difficulties, and all sub-dimensions (emotional symptoms, conduct problems, hyperactivity/inattention problems, and peer problems) ( $P < 0.001$ ). Logistic regression analysis revealed that placing electronic devices in sleeping or play areas, whether caregivers provided interactive commentary during viewing, caregivers' attitudes toward children's screen use, whether screen contact was actively requested or passively participated in, and children's reactions to forced screen shutdown were all influencing factors for emotional and behavioral problems in preschool children with ASD ( $P < 0.05$ ).

**Conclusion:** Screen exposure can affect the emotional and behavioral problems of preschool children with autism. Parents should rationally manage screen use for preschool children with autism.

**Keywords:** Autism spectrum disorders, Screen exposure, Emotional and behavioral problems, Preschool children, Influence factor

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## Introduction

Screen exposure refers to a range of activities involving contact with electronic screens, including watching television, using smartphones, and playing video games [1]. Technological advancements have made electronic screens readily available in daily life, with usage trends showing increasing prevalence among younger age groups. Mounting evidence indicates that early and inappropriate screen exposure not only affects vision in preschool children [2] but also contributes to metabolic diseases such as obesity and diabetes [3], while additionally impacting children's emotional and behavioral development. A Chinese study investigating screen exposure and emotional/behavioral problems in preschool children demonstrated that compared with children who watched screens for less than one hour daily, longer screen time was associated with greater risk of emotional and behavioral problems [4].

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by core symptoms of social communication impairment, repetitive behaviors, and restricted interests. Statistics show that 68.32% of children with ASD exhibit emotional and behavioral problems [5], manifesting as overt behaviors such as shouting, unexplained crying, self-injury, and aggression toward others, or as internalized symptoms like anxiety and depression. The presence of emotional and behavioral problems not only increases the difficulty and intensity of rehabilitation training for children with ASD and affects intervention outcomes but also creates substantial psychological and economic burdens for families. Therefore, exploring factors associated with emotional and behavioral problems in children with ASD is of significant importance.

While screen exposure has been shown to affect emotional and behavioral problems in typically developing preschool children, our literature review revealed

that previous research has primarily focused on this population. Studies examining screen exposure in preschool children with ASD are limited, and research investigating the impact of screen exposure on emotional and behavioral problems in this specific population is particularly scarce. Consequently, this study aims to investigate screen exposure patterns and emotional/behavioral problems in preschool children with ASD, understand the current status of screen exposure and its impact on emotional and behavioral problems, and provide strategies and evidence for early comprehensive intervention in children with ASD who have unhealthy screen exposure habits.

## Methods

**Study Participants** Children with autism spectrum disorder diagnosed at the specialist outpatient clinic of our hospital's Department of Child Development and Behavior between February and August 2022 were selected as the ASD group. Inclusion criteria were: (1) age under 6 years; (2) diagnosis confirmed by a specialist according to DSM-V criteria [6]; and (3) informed consent obtained from all participating caregivers. Exclusion criteria included: (1) presence of tuberous sclerosis, Rett syndrome, fragile X syndrome, visual or hearing impairments, global developmental delay, cerebral palsy, or genetic metabolic diseases; and (2) respondents who were not the child's primary caregiver or had insufficient knowledge of the child's condition.

Concurrently, typically developing children from a kindergarten in Zhengzhou were selected as the control group. Sample size was calculated as 10 times the number of variables in the largest questionnaire. Based on inclusion and exclusion criteria, 400 questionnaires were distributed to primary caregivers of children with ASD, with 379 valid responses returned (valid response rate: 94.75%). For the control group, 400 questionnaires were distributed, with 386 valid responses returned (valid response rate: 96.5%). This study was approved by the Medical Ethics Committee of the Third Affiliated Hospital of Zhengzhou University (Ethics Approval Number: 2022-217-01).

## Survey Instruments

1. **Basic Information Questionnaire:** A "Child Basic Information Questionnaire" was developed through literature review to collect demographic information including gender, age, and basic family circumstances, as well as environmental risk factors associated with ASD.
2. **Screen Exposure Questionnaire:** Based on domestic and international literature regarding screen exposure factors, the research team developed a "Screen Exposure Questionnaire" [7] covering aspects such as types of screens accessed, screen content, screen time, and screen management.
3. **Strengths and Difficulties Questionnaire (SDQ):** The parent-version SDQ, compiled by British psychologist Goodman, is widely used internationally to assess emotional and behavioral problems in various

child populations [8]. This study utilized the Chinese version adapted by Professor Du Yasong' s team in Shanghai, comprising 25 items rated on a 0-2 scale ( "not true," "somewhat true," "certainly true" ). The questionnaire yields five dimensions: emotional symptoms, conduct problems, hyperactivity/inattention problems, peer relationship problems, and prosocial behavior, plus a total difficulties score derived from the four problem dimensions [9]. The scale demonstrates good reliability and validity, with a Cronbach' s  $\alpha$  coefficient of 0.746.

**Quality Control** Survey administration was conducted by fixed personnel with unified instructions. No suggestive language was used during questionnaire completion. After collection, quality control inspectors reviewed all questionnaires to ensure no missing or incorrect responses before data entry. Double data entry and verification were performed to ensure accuracy.

**Statistical Analysis** All collected data were entered into Excel and analyzed using SPSS 26.0 statistical software. Categorical data were expressed as frequencies and percentages. Multiple response questions were defined as multiple response sets. Inter-group differences were compared using chi-square tests. Logistic regression models were constructed with children' s emotional and behavioral problem detection status (0=normal, 1=borderline/abnormal) as the dependent variable and screen exposure levels as independent variables, adjusting for children' s age, gender, caregiver, and availability of play space near home.  $P < 0.05$  was considered statistically significant.

## Results

**Comparison of Basic Characteristics** No significant differences were observed between the ASD and control groups in gender, birth mode, gestational age, age, family type, family residence, caregiver education level, monthly income, primary caregiver occupation, presence of siblings, or total family population ( $P > 0.05$ ). However, the proportion of children whose primary caregivers were both parents was lower in the ASD group compared to the control group, and the proportion of families with play space near home was also lower in the ASD group, with statistically significant differences ( $P < 0.001$ ). See Table 1 .

**Comparison of Screen Exposure** **Screen Exposure Types and Content:** No statistically significant differences were found between children with ASD and control children in types of electronic screens accessed or screen content ( $P > 0.05$ ). See Table 2 .

**Screen Time:** Significant differences were observed between children with ASD and controls in both age at first screen exposure and daily screen time ( $P < 0.001$ ). Compared with the control group, children with ASD showed higher rates of screen exposure before 18 months of age and longer daily viewing times. See Table 3 .

**Screen Management:** Significant differences were found between the ASD and control groups in whether electronic devices were placed in children's sleeping or play areas, whether interactive commentary was provided during viewing, caregivers' attitudes toward children's screen use, and whether screen contact was actively requested or passively participated in ( $P < 0.001$ ). See Table 4 .

**Screen Deprivation Responses:** When screens were forcibly turned off, children in the ASD group showed significantly higher rates of crying and emotional volatility compared to the control group, with a statistically significant difference ( $P < 0.001$ ). See Table 5 .

**Comparison of Emotional and Behavioral Problems** Based on SDQ cutoff scores for total difficulties and each dimension, the ASD group showed significantly higher detection rates of emotional and behavioral problems in total difficulties and all sub-dimensions compared to the control group ( $P < 0.001$ ). See Table 6 .

**Logistic Regression Analysis of Screen Exposure and Emotional/Behavioral Problems in Children with ASD** Using detection status of emotional and behavioral problems in children with ASD (0=normal, 1=borderline/abnormal) as the dependent variable and screen exposure as the independent variable, logistic regression analysis was performed adjusting for children's age, gender, caregiver, and availability of play space near home. Results showed that placing electronic devices in sleeping or play areas, whether caregivers provided interactive commentary during viewing, caregivers' attitudes toward children's screen use, whether screen contact was actively requested or passively participated in, and children's reactions to forced screen shutdown were influencing factors for emotional and behavioral problems in preschool children with ASD ( $P < 0.05$ ). See Table 7 .

## Discussion

This study found that emotional and behavioral problems are common among preschool children, with even greater prominence in preschool children with ASD. While some children with ASD inherently have emotional and behavioral problems, a considerable proportion of these issues may arise from environmental factors. Screen exposure manifests in various forms, and inappropriate screen exposure negatively impacts children's neurodevelopment and social functioning. This study combines the increasingly prominent issue of "screen exposure" with emotional and behavioral problems in preschool children with ASD, attempting to explore new risk factors related to emotional and behavioral problems in this population.

**High Prevalence of Emotional and Behavioral Problems in Preschool Children with ASD** According to this study, 76.78% of children with ASD

showed abnormal total difficulties scores. Across dimensions, the highest abnormal detection rate was for peer relationship problems (88.13%), followed by hyperactivity/inattention problems (71.24%), prosocial behavior (59.90%), conduct problems (41.16%), and emotional symptoms (15.57%). All dimensional abnormal detection rates were significantly higher than those in typically developing children. Current research on emotional and behavioral problems in preschool children with ASD is limited, but our literature review found these results similar to those reported by Wang Anyun et al. [10] in a study investigating emotional/behavioral problems and eating issues in 150 preschool children with ASD.

**Concerning Screen Exposure Patterns in Preschool Children with ASD** This study found that screen exposure is widespread among preschool children with ASD, with television being the most common medium (89.20%) and cartoons being the primary content (88.70%). Although no statistically significant differences were found in these two aspects compared to typically developing children, children with ASD have poorer cognitive understanding and social interaction abilities. As a passive medium, television and non-educational content like cartoons may have greater impact on the cognitive and social development of preschool children with ASD compared to typically developing children [11].

The American Academy of Pediatrics (AAP) 2016 guidelines on children's screen exposure explicitly state that electronic device use (except for video chatting) is discouraged for infants under 18 months, and children over 2 years should have screen time limited to less than 1 hour daily [12]. This study found that 59.40% of preschool children with ASD began using electronic screens before 18 months of age, and 53% had daily screen time exceeding 1 hour. International reports indicate that children with ASD typically begin using screens 6 months earlier than typically developing children, suggesting a greater preference for television [13]. A U.S. study of school-age children with ASD found they spent over 2 hours daily on television and videos, plus an additional 1-2 hours on computers and mobile devices [14].

Research on screen exposure in preschool children with ASD is limited. A Chinese study investigating screen exposure and sleep problems in preschool children with ASD reported that 35.6% had daily electronic screen time exceeding 1 hour [15], whereas our study found this proportion to be 53%—substantially higher. This discrepancy may be related to increased home confinement and limited indoor activities during the COVID-19 pandemic in recent years. Although some children with ASD inherently have emotional and behavioral problems, based on the aforementioned research, we hypothesize that early screen exposure may further exacerbate these issues in children with ASD.

This study also found that compared with controls, caregivers of children with ASD lacked proper screen management, as evidenced by: 60.20% placing electronic devices in children's sleeping or play areas, 27.20% providing no interac-

tive commentary during viewing, 31.70% holding permissive attitudes toward children's screen use, and 24.80% not regulating their own screen use, resulting in high rates of passive viewing by children. This may occur because raising children with ASD requires significantly more time and energy than raising typically developing children, leading some caregivers to use screens as "electronic babysitters" to free time for other tasks [16]. Additionally, this study found that 21.10% of preschool children with ASD were cared for by grandparents who tended to be indulgent and lacked awareness of screen exposure risks, resulting in lax screen management.

**Screen Time and Emotional/Behavioral Problems** Research confirms that earlier age at first screen exposure is associated with greater negative impacts on physical and mental health. Infancy and early childhood represent critical periods for brain neuron growth and development, during which functional networks related to emotional and cognitive processing are still maturing and remain highly sensitive to environmental stimuli. As an environmental factor, early screen exposure can affect brain functional connectivity, leading to hyperactivity/inattention problems [17]. ALDAD et al. [18] demonstrated from the perspective of electronic radiation that early screen exposure can damage the frontal lobes of young mice, resulting in hyperactivity and anxiety-like behaviors. A Middle Eastern study also found that earlier screen exposure in children with neurodevelopmental disorders was associated with more prosocial behavior problems [19]. This study found that children with ASD who were exposed to screens at younger ages showed higher abnormal detection rates of emotional and behavioral problems. Previous neuroimaging research has demonstrated that children with ASD inherently have hypometabolism in the frontal lobes and dysfunctional neural network connectivity, which can lead to social and emotional deficits. Although some children with ASD already have emotional and behavioral problems, we hypothesize that early screen exposure may further aggravate these issues.

This study also found that longer screen time was associated with emotional and behavioral problems. HINKLEY et al. [20] reported that each additional hour of screen exposure during early childhood increased the risk of emotional and behavioral problems by 1.2 to 2.0 times. Children with ASD have restricted interests and relatively limited social activities, leading them to spend more time on electronic screens. Some children with ASD exhibit anxiety and aggressive behaviors, which are thought to be related to abnormal serotonin levels and limbic system dysfunction. Research has confirmed that excessive screen time can affect neurotransmitter levels and limbic system activity, producing emotional and behavioral problems [21]. Additionally, "displacement theory" suggests that when children spend more time on electronic screens, time for other activities is reduced. For children with ASD, excessive screen time shortens opportunities for parent-child communication and skill learning, which is detrimental to rehabilitation. Therefore, controlling screen time is particularly important for preschool children with ASD.

**Poor Screen Management and Emotional/Behavioral Problems** This study found that not placing electronic devices in children's sleeping or play areas was a protective factor against hyperactivity/inattention problems in preschool children with ASD (OR=0.486). Compared with the control group, children with ASD had higher rates of devices placed in sleeping or play areas, which increased accessibility and convenience of screen use. Research has shown that children with televisions in their bedrooms have three times more sedentary screen time than those without [22]. When electronic screens play in children's play areas, they serve as background media exposure that can distract children and lead to hyperactivity/inattention problems, even when children are not actively watching [23]. Furthermore, screens in bedrooms can disrupt children's sleep, which mediates the relationship between screen exposure and emotional/behavioral problems [24]. Given that 50%-80% of children with ASD have sleep problems, sleep deprivation can also cause various emotional and behavioral issues.

Lack of interactive commentary from parents during children's screen use can lead to emotional and behavioral problems. Preschool children universally experience "transfer deficits" —television screens present two-dimensional images with limited sensory input and interactivity. Children with ASD have emotional expression and comprehension deficits that prevent them from understanding screen content and applying it to real-life situations, potentially causing emotional and behavioral problems [25]. Additionally, they often have joint attention deficits, which are crucial components of social interaction. Parental participation and eye contact during screen viewing facilitate social development and reduce internalizing problems [26]. Research has also shown that the preschool brain is highly plastic, with early screen exposure stimulating specialized development of non-social audiovisual processing pathways that compete with social brain networks. Children with ASD inherently have dominant non-social neural pathways, and parental interactive commentary during screen viewing can help reverse abnormal neural connections, promote social brain development, and increase prosocial behavior [27]. Our logistic regression analysis found that frequent parental interactive commentary during screen viewing was a protective factor for prosocial behavior problems (OR=0.345) and total difficulties (OR=0.206). Therefore, parental interactive commentary during screen viewing should be emphasized for preschool children with ASD.

This study found that 31.70% of caregivers in the ASD group held permissive attitudes toward children's screen use. This may occur for several reasons: First, children with ASD have restricted interests and visual preferences for colorful images, leading caregivers to expect screens to provide educational benefits. However, this study found that 88.70% of children with ASD primarily watched cartoons rather than educational content. Li Wangyang et al. [11] reported that non-educational video viewing is detrimental to children's socio-emotional development. Second, due to children's poor rule-following and difficulty with emotional regulation, caregivers may use screens as soothing tools to alleviate parenting stress [28].

This study found that caregivers holding neutral (OR=0.435) or strictly prohibitive (OR=0.214) attitudes toward screen use were protective factors for prosocial behavior problems. Additionally, neutral attitudes (OR=0.200) were protective against total difficulties. We hypothesize that these attitudes reduce screen time and non-educational content viewing, thereby decreasing emotional and behavioral problems [29].

Passive screen exposure when parents watch electronic screens was a significant risk factor for emotional and behavioral problems, including emotional symptoms (OR=1.738), conduct problems (OR=2.033), and prosocial behavior problems (OR=2.556). Preschool children have limited activity ranges, high dependence on parents, and strong curiosity and imitation abilities. Previous research found that some children with ASD are more interested in adult viewing content, so when parents watch screens for entertainment, it increases children's screen exposure time and may expose them to fast-paced or violent content that weakens attention and causes aggressive behaviors. Additionally, caregivers' screen use reduces effective companionship time with children, limiting emotional resonance over screen content and missing opportunities for parent-child emotional exchange, which is detrimental to social development. Therefore, primary caregivers should regulate their own screen use to set positive examples for children.

When screens were forcibly turned off (screen deprivation), crying in preschool children with ASD was a risk factor for conduct problems (OR=2.224), indicating strong screen dependence and poor emotional regulation in these children. This suggests caregivers should reduce using electronic screens as reinforcement rewards for skill development and decrease children's dependence on mobile phones.

In summary, screen exposure is associated with emotional and behavioral problems in preschool children with ASD. We recommend that parents of preschool children with ASD rationally manage children's screen use, regulate their own screen use, and strengthen parent-child interaction to promote healthy development.

### **Limitations**

This study has several limitations. As a cross-sectional study, the questionnaire survey may be subject to recall bias. The listed screen content was limited, focusing primarily on negative effects of screen exposure on emotional and behavioral problems. Interactive screen content such as virtual interactions and their effects on emotional and behavioral problems in children with ASD were not included. Future research should further investigate the impact of screen exposure on emotional and behavioral problems in children with ASD.

### Author Contributions

DUAN Guiqin proposed the main research objectives, designed the study, and supervised implementation. GE Linling collected and organized data, performed statistical analysis, and drafted the manuscript. YIN Jiabao created tables and figures. ZHAO Minfang and NIE Wenhao revised the manuscript. DUAN Guiqin was responsible for quality control, review, and supervision.

### Conflict of Interest

The authors declare no conflict of interest.

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