

Association Between Screen Time Exposure and Autism Spectrum Disorder Like Symptoms in Al-Baha Region

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Research Article

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Abstract

Background:

Autism Spectrum Disorder (ASD) is an emerging neurodevelopmental disorder that features impairments in social communication and repetitive behavior. There is new evidence to show that excessive exposure to screens is likely to play a role in ASD-like signs, but regional data are scant, especially in Saudi Arabia. This research attempts to investigate the relationship between usage of smart devices and ASD-like behavior in children in the Al-Baha area.

Methods:

A cross-sectional, self-report questionnaire study was performed among 243 parents or primary caregivers of 1–18-year-old children in Al-Baha, Saudi Arabia. Information on screen time habits, behavioral reactions, socio-demographics, and ASD-like symptomatology was gathered through a verified bilingual electronic questionnaire. Descriptive analyses, Chi-square tests, ANOVA, and logistic regression were performed with a $p < 0.05$ level of significance.

Results:

Smart device use was seen in 92% of children, with more than half having over 3 hours of screen time per day. Excessive use was strongly correlated with greater social isolation (74%), emotional dysregulation (43% exhibiting acute reactions upon device removal), and poor communication improvement (62% having partial or no improvement). YouTube and entertainment apps were the most commonly used platforms. Non-school-going children or those who had no siblings were more dependent on screens. Even with a high level of parental education, awareness of ASD was low.

Conclusion:

The results indicate a significant correlation between extended use of smart devices and symptoms of ASD in children. The findings highlight the importance of early screening, education of parents, and public health policy to manage screen time during these sensitive developmental periods.

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that is heterogeneous in nature and is marked by enduring deficiencies in social interaction, communication, and the occurrence of limited, repetitive patterns of behavior, interests, or activities (Casanova et al., 2024). Autism Spectrum Disorder has increased significantly on the global front, with new estimates indicating that the condition affects about 1 in every 100 children (“Autism,” n.d.). Although genetic susceptibility is a major contributor to

ASD etiology, there has been growing interest in the involvement of modifiable environmental risk factors that may cause or heighten ASD-like symptoms in early childhood (Yenkoyan et al., 2024). One such factor is the growing exposure of children to screen-based technologies like smartphones, tablets, computers, and television sets. Several studies have posited that too much screen time, especially at an early age, can disrupt cognitive, language, and social-emotional development (Muppalla et al., 2023). These disturbances can replicate or even cause ASD-like symptoms, such as weak eye contact, speech delay, emotional dysregulation, and social withdrawal (Dell’Osso et al., 2023). Significantly, passive screen engagement—such as extensive video watching—has been linked more emphatically with developmental delay than interactive or educational screen use (Yland et al., 2015).

The Kingdom of Saudi Arabia has undergone rapid digitalization over the past few years, with a significant increase in the ownership of smart devices and access to the internet (5, 2024; Alshoaibi et al., 2023). Children within Saudi families are introduced to digital technology at an early age, and usage increases across age groups (Almaqhawi and Albarqi, 2022). Limited data are, however, available on how such screen exposure patterns affect child development, especially with regard to ASD-like features. Such a lack of local data is particularly alarming in areas such as Al-Baha, where cultural, educational, and environmental determinants could have unique impacts on parenting, use of digital media, and neurodevelopmental disorder awareness (Peng et al., 2024).

Thus, this research was conducted to explore the relationship between smart device screen time and the development of ASD-like symptoms in children in the Al-Baha area. Through an exploration of sociodemographic factors, device usage patterns, and behavioral outcomes, this study hopes to add to the understanding of possible risk factors for developmental delays and provide data to inform culturally relevant public health interventions and parent awareness initiatives.

Materials and Methods

Study Design and Setting

It aimed to explore the relationship between exposure to screen time and symptoms of ASD-like in Saudi Arabian children living in the Al Baha region. Data were collected from December 2025 to January 2026. Ethical clearance was granted by the appropriate institutional review board before the data collection took place.

Participants

The population for the study was parents or the primary caregivers of children aged 1 to 18 years who lived in the Al-Baha area. The participants were enlisted through social media and outreach programs. 243 respondents who gave informed consent were included in the final analysis. Inclusion criteria were: (i) parent of a child living in Al Baha, (ii) willingness to participate, and (iii) full responses to the

questionnaire. Questionnaire responses with missing or incomplete key information (e.g., child's age, screen time information) were excluded.

Data Collection Tool

Data were gathered with a self-administered, structured electronic questionnaire specially designed for the research. It was available in both English and Arabic to facilitate access across the varied linguistic background of Al Baha participants. Its content validity was ensured by pretesting it through review by a panel of multidisciplinary experts in pediatrics, psychiatry, and epidemiology. With the endorsement of experts, the questionnaire was pilot-tested with 15 subjects to determine clarity, relevance, and time for completion, after which minor changes were instituted. The last instrument consisted of 35 items covering several major domains including child demographic data (age, gender, caregiver relationship), history of autism spectrum disorders in the family, trends in screen time exposure (daily hours broken down as < 1 hour, 1–2 hours, 3–4 hours, 5–6 hours, and > 6 hours), favourite types of applications and devices, and usual usage duration.

Moreover, the questionnaire probed behavioral tendencies related to screen use, including emotional reactions to device removal, physical activity variation, social isolation tendencies, communication emergence, and the onset of any unique talent or ability. Screening for ASD-like symptoms was conducted based on caregiver report of poor communication, social interaction impairment, restrictive behavior, and emotional dysregulation. The questionnaire was distributed online via focused online forums, parent groups, and community centers in the Al Baha area to achieve the widest possible reach and to secure a representative sample through recruitment.

Outcome Measures

The main outcome was the occurrence of ASD-like symptoms, operationally defined as the report of positive endorsement on specific items describing poor social interaction, impaired communication, limited and repetitive behavior, and/or emotional dysregulation. The secondary outcomes were: (i) the frequency and type of exposure to screen time, and (ii) behavioral reactions attributed to device usage (e.g., enhanced isolation, emotional dysregulation).

Statistical Analysis

Data were imported and entered into Microsoft Excel (Microsoft Corporation, Redmond, WA) and then analyzed with SPSS version 26.0 (IBM Corp., Armonk, NY) ("IBM SPSS Statistics 25 Brief Guide," n.d.). Descriptive statistics were employed to describe demographic information and screen time trends. Categorical variables were reported as frequency and percentage, whereas continuous variables (e.g., age) were reported as mean $\pm$ standard deviation (SD). Correlations between screen time categories and ASD-like symptoms were evaluated by Chi-square tests for categorical variables. Logistic regression

analysis was carried out to examine independent predictors of ASD-like symptoms, controlling for potential confounding factors like age, gender, and family history of autism. Statistical significance was defined as $p\text{-value} < 0.05$.

Ethical Considerations

Results

Demographic Features of the Study Population Including Family History for Autism, Distribution by Gender, Geographic Location Representation, and Status of Being Siblings within Al-Baha Area

(A) Family History of Autism

The participant distribution according to family history of autism indicated that the majority (around 85%) had no family history of autism spectrum disorders (ASD), while only around 15% had a positive family history (Fig. 1A). This significant difference implies that although genetic components continue to play a significant role in the etiology of ASD, in this particular sample from the Al-Baha area, familial inheritance is less significant than in sporadic cases. The strong skew towards "No Family History" ($p < 0.001$, Chi-square test) suggests that environmental and non-genetic components, such as lifestyle habits like screen time, might play a greater role in the expression of ASD-like symptomatology within this group. The results are consistent with earlier reports that while family history plays a role in the risk of ASD, penetrance varies extensively among different geographical and ethnic populations.

(B) Gender

Gender analysis of the participants revealed 59% were men and 41% were women, representing a male dominance that is in line with the established worldwide epidemiology of autism spectrum disorders, in which more often than not males are more affected than females by a ratio of about 4:1 (Fig. 1B). Even though this cohort for the study was not randomly chosen on the basis of an ASD diagnosis, the predominance of males might reflect in part intrinsic gender-based susceptibility to ASD-like characteristics under exposure to environmental risk factors such as prolonged screen time. Statistical examination by means of a binomial proportion test substantiated that the gender split differed significantly from a balanced male-female distribution ($p < 0.05$). These results demonstrate the importance of sex-specific examinations in further investigations of the relationship between screen exposure and neurodevelopmental outcomes.

(C) Region

Regional findings showed that the largest number of participants (68%) were from the Al-Baha region as a whole, with smaller groups from Mecca (15%), Riyadh (7%), the Eastern Province (4%), and from other unspecified areas (6%). This geographical spread ensures that the study sample is largely representative of the population of Al-Baha, thereby increasing the generalizability of the results to this particular region

(Fig. 1C). The predominance of local participants is also in favor of the applicability of exploring environmental exposures, including variations in screen usage habits and availability of digital media within regions, as risk factors of ASD-like symptoms. Chi-square testing for equality of distribution indicated significant regional clustering ($p < 0.01$), which should be taken into account when interpreting associations between screen time behaviors and neurodevelopmental outcomes.

(D) Child with Siblings

Sibling status data showed that children with siblings made up a larger proportion than children without siblings. Particularly, children who had siblings were much more prevalent, indicating that sibling interaction, as part of family structure dynamics, could possibly affect the quality and quantity of screen time exposure. Children with no siblings could possibly spend relatively more unsupervised time around screens, possibly a factor that could affect social and communicative development. Statistical comparison *via* independent sample t-tests revealed that the difference in proportion between children with and without siblings was significant ($p < 0.05$) (Fig. 1D). These results suggest that the presence of siblings might be a socializing protective factor against overmuch solitary screen exposure, and that this is an important variable to control for when analyzing ASD-like symptomatology.

Table 1
Study Design and Demographic Characteristics of Participants (N = 243).

Parameters	Description/Findings
Study Design	Cross-sectional, questionnaire-based, conducted in Al-Baha, Saudi Arabia
Participants	243 parents/caregivers of children aged 1–18 years
Ethical Approval	Obtained from institutional review board
Child Gender Distribution	Male: 59%, Female: 41%
Family History of Autism	No history: 85%, Positive history: 15%
Region	Al-Baha (68%), Mecca (15%), Riyadh (7%), Eastern Province (4%), Others (6%)
Sibling Status	Children with siblings: higher proportion than those without ($p < 0.05$)
School Attendance	In school: 73%, Not attending: 27%
Type of School	Government: 62%, Private: 16%, Not applicable: 22%
Physical Activity	Active: 56%, Inactive: 44%
Body Build	Mostly Normal; others include Thin, Overweight, Obese, Very Thin

Table 1 captures a tabular summary of the study design and demographic profile of participants engaged in this cross-sectional study in the Al-Baha region of Saudi Arabia. The study population

included 243 parents or primary caregivers of 1–18-year-old children, providing a representative and adequate sample for the analysis of screen time and the association with ASD-like symptoms. The gender ratio of the children was biased towards males (59%), in line with worldwide trends for increased ASD incidence in males. A large majority (85%) indicated no family history of autism, indicating predominance of sporadic cases among this group and supporting the applicability of environmental risk factors such as screen exposure to the etiology of ASD-like behavior. Regional representation was led by representatives from Al-Baha (68%), adding strength to the contextual relevance of the study results. With regard to family composition and educational exposure, most children had siblings, which was statistically significant and could be a protective factor against social isolation caused by screen overuse. Parental educational background was mostly high, with most fathers and mothers having reached university level; however, awareness of ASD was low. As for the educational status of children, 73% were attending school, and the majority of these attended government schools (62%), indicating socioeconomic similarity (Table 1). Additionally, physical activity profiles indicated that 56% of children were active, and body build measures also indicated a preponderance of normal physique, both of which are significant variables when investigating the effect of sedentary screen activities. These demographic factors not only place the findings in context but also enable a better understanding of how lifestyle and sociocultural variables act as mediators between screen exposure and neurodevelopmental outcomes.

Parental Educational Level and Perceived Effect of Smart Device Use on Children's Physical Activity

(A) Father's Educational Level

Parental education distribution among the participants indicates a consistent dominance of university-level education. In particular, 59% of the fathers were indicated to be university students, while 24% had secondary education and 6% were graduates. The rest—postgraduates (4%), intermediate (3%), elementary (2%), and others (2%)—represented a minority (Fig. 2A). This educational trend indicates that most fathers had access to higher education, and this could impact parenting behavior, knowledge of developmental milestones, and screen time attitudes. The biased distribution was statistically significant ($p < 0.01$, Chi-square test), indicating that paternal education level should be considered as a potential modulating factor in children's screen exposure and behavioral outcomes. The level of education may also have an effect on parental awareness and response to early ASD-like symptoms.

(B) Mother's Education Level

As with the paternal trend, maternal education levels were also predominantly higher education, though slightly more diversified. University students were the majority (48%), followed by secondary educated mothers (25%), intermediate (8%), postgraduate (7%), graduate (6%), elementary (4%), and others (2%) (Fig. 2B). This suggests that almost three-quarters of mothers had achieved secondary-level education or higher, which could be associated with increased availability of health information, awareness of digital parenting, and perhaps identification of developmental abnormalities. The difference in mothers' educational levels was statistically significant ($p < 0.05$, Chi-square test), and indicates that maternal

education may be the key factor influencing how screen time is controlled at home, as well as the early detection of symptoms related to ASD.

(C) Parents' Knowledge about Autism

The bar chart comparison of parental awareness about autism shows that a high percentage of participants had minimal or no formal education about autism spectrum disorders (Fig. 2C). The "Others" group had the highest frequency (mean $\pm$ SEM), followed by elementary, postgraduate, and secondary education levels, respectively. Parents with postgraduate education showed a relatively higher level of awareness, whereas those with only secondary or less education showed lower levels of knowledge. These differences were significant statistically ($p < 0.01$, ANOVA), which further strengthened the correlation between level of education and awareness regarding autism. This knowledge gap among parents is clinically important since limited awareness of ASD can result in delayed early diagnosis and intervention, particularly in settings with high digital exposure and low pediatric neurodevelopmental screening.

(D) Effect of Smart Devices on Physical Activity

Parental perception about how smart device use affects the physical activity of their children was assessed and shown that nearly 70% of the large majority thought it decreased physical activity, whereas 30% thought that it didn't (Fig. 2D). The difference was statistically important ($p < 0.001$, Chi-square test). This perceived decrease in physical activity is potentially more important for overall neurodevelopment in children already predisposed to ASD-like behavior. Increased screen time has been linked with sedentary lifestyle and decreased social interaction, both of which are risk behavior for delayed cognitive as well as behavioral development. The evidence highlights the need for public health education to create awareness regarding the behavioral and physiological effects of excessive digital exposure in early childhood.

(A) Distribution of fathers' educational levels among participants, with the majority being university students (59%), followed by secondary (24%), graduate (6%), postgraduate (4%), intermediate (3%), elementary (2%), and others (2%). (B) Educational level of mothers, where the university-educated level was most prevalent (48%), followed by secondary (25%), intermediate (8%), postgraduate (7%), graduate (6%), elementary (4%), and others (2%). (C) Knowledge about ASD, broken down by level of education, with the highest among postgraduates and the lowest among the secondary or less educated groups. (D) Perceived impact of smart device use on physical activity, in which most (about 70%) indicated that it has a negative impact on physical activity, and 30% felt that there was no impact. Error bars are for SEM where appropriate. Statistical significance was evaluated using Chi-square and ANOVA tests with a cut off at $p < 0.05$.

Educational Status, School Type, and Physical Activity Patterns Among Children

(A) School Attending Child

Of the 243 study participants, most children (73%) were said to be in school, with 27% not being enrolled at the study time (Fig. 3A). The difference was significant statistically ($p < 0.01$, Chi-square test), indicating a strong trend for formal education in the study sample. School attendance is a key variable when considering ASD-like symptom assessment, as organized educational settings can impact social interaction, routine behavior, and screen time exposure. Children who are not in school may have varying developmental pathways and greater unsupervised screen use, which can confound the relationship between screen time and ASD-like behaviors. This distribution warrants the inclusion of educational engagement as a moderating factor in developmental assessment.

(B) Types of School

Among the school-going children, most were in government schools (62%), then 16% in private schools, with 22% in the "Not Applicable" category (presumably not in school at the moment) (Fig. 3B). This breakdown reflects a high dependency on public school facilities in Al-Baha province and could represent larger socioeconomic trends. The lower ratio in private schooling might reflect differential access to resources that impact digital media exposure and early developmental screening. Statistical analysis with a Chi-square test indicated a significant difference among the categories ($p < 0.05$), furthering the need to examine how school type can possibly modulate access to developmental support services, such as ASD diagnosis and intervention.

(C) Child with Physical Activity

The research revealed that 56% of the children were reported to be physically active, while 44% were not—an almost equal split but with a small bias towards physical activity (Fig. 3C). This is an important finding because lower physical activity has been identified as a risk factor for overexposure to screen time and its behavioral consequences. Statistical testing by two-proportion z-test indicated this difference to be significant ($p < 0.05$). Near equivalence implies that despite a narrow predominance of active children, an appreciable subgroup may be physically inactive, with perhaps more use of screens contributing to this situation. Since it has been noted that physical inactivity is also related to neurodevelopmental impairments, inclusion of this indicator in multivariate analyses of determinants of screen time and associated ASD-like manifestations would be a requirement.

(D) Body Built

Body build analysis among the children showed an interesting trend: most children were reported to have a "Normal" body build, followed by "Thin," and fewer children were reported as "Overweight," "Obese," or "Very Thin." The "Normal" category also had the highest mean value with minimal standard error, showing a consistent central tendency in the data set (Fig. 3D). Distribution was statistically significant ($p < 0.01$, ANOVA), and it has implications in measuring the physical effects of screen use. Body build may serve as a marker for lifestyle variables such as eating habits and activity levels, both of which are inseparable from screen behavior and possible neurobehavioral hazards. This parameter provides value added in

understanding the overall health profile of the population being examined, especially among children with suspected developmental issues.

Patterns of Smart Device Use and Its Concomitant Effects Among Children

(A) Smart Device Using Child

A large majority (92%) of the children in the study were said to use smart devices, as compared to just 8% who did not. This very high prevalence indicates the pervasiveness of exposure to digital media among children in the Al-Baha region. Statistical significance was established through a binomial proportion test ($p < 0.001$), highlighting the normativity of smart device use within this population (Fig. 4A). The high rate of exposure warrants close monitoring of screen-related behavioral and developmental consequences, especially given known associations between overuse of devices and delayed speech, decreased physical activity, and ASD-like characteristics. This finding validates the use of screen time as a core variable in pediatric behavioral health research.

(B) Purpose of Utilizing Smart Devices

Usage motivation analysis indicated that the most prevalent purpose of using smart devices was "Entertainment" (tallest bar), followed by "Learning," "Watching Videos," "Games," and "Communication." Entertainment had the highest proportion, indicating that passive consumption of content is more prevalent than educational or interactive use (Fig. 4B). ANOVA testing indicated significant differences between categories ($p < 0.01$). These patterns of use are relevant to clinicians because passive screen viewing has been found to be more strongly associated with language delays and attention difficulties than educational or interactive uses. The discovery also leads to overstimulation and parent-child interaction deficits—both risk factors for ASD-like behaviors—in children whose exposures are primarily digital entertainment.

(C) Daily Time on Smart Devices

The distribution of daily screen use showed a pronounced gradient: 3 or more hours per day accounted for the largest share, followed by 2–3 hours, 1–2 hours, and < 1 hour. The least common group was children with zero screen use (Fig. 4C). The distribution reflects a statistically significant skew toward extended daily exposure ($p < 0.001$, Chi-square test). Excessive screen time, particularly over 2 hours a day, has been linked to delayed cognitive, language, and socio-emotional development. In research on ASD, such trends are of concern since prolonged solo device use can mirror or amplify symptoms like decreased eye contact, minimal verbalization, and limited interests.

(D) Attachment Towards Smart Devices with Respect to Age

Age-specific analysis revealed that older kids (e.g., 6 + years) exhibited greater attachment levels to smart devices, with the intensity decreasing with younger age groups. The oldest age group had the highest attachment score, whereas toddlers had the lowest levels. The trend was statistically significant ($p < 0.05$, linear regression), indicating an increase in dependency on smart devices with development (Fig. 4D). Although some growth is anticipated with age, the pronounced attachment found in older children is troubling if it supersedes interpersonal interaction, play, or physical exercise. In at-risk children or those with presenting ASD-like features, greater attachment to screens also may further reinforce social withdrawal or sensory preoccupation.

Effect of Use of Smart Devices on Isolation of Child and Skills of Communication.

(A) Child Isolation During Use of Smart Devices

Analysis found that 74% of the parents noticed more child isolation during smart device use compared to 26% who noticed no effect. This high difference was statistically significant ($p < 0.001$, Chi-square test). The rise in social withdrawal was consistent with fears that excessive screen time is generating isolate behavior that may look like or worsen ASD-like behavior, like inadequate eye contact and limited social interaction (Fig. 5A). These results add evidence to the contention that passive digital engagement can disrupt normal socio-emotional development, particularly if unstructured or unregulated.

(B) Enhancement of Communication During Use of Smart Devices

Parents' impression of communication enhancement during use of smart devices was inconsistent. While 18% indicated improvement in communication, 20% indicated no improvement, and the majority (62%) indicated that communication improved only at times (Fig. 5B). This trend, which was statistically significant ($p < 0.01$, Chi-square test), highlights the situational nature of the role of digital media in language and communication development. The high rate of children who indicated only partial or situational improvements might be an indication of reliance on content type and level of supervision. These findings indicate that although smart devices may have some pedagogical value, their potential to develop enduring communication gains is restricted and not generalizable.

(C) Frequent Apps

Of the kinds of apps utilized by children, YouTube was the most popular platform, followed by games, educational apps, cartoons, and social apps. Differences in frequency were statistically significant ($p < 0.001$, ANOVA). The prevalence of YouTube suggests that passive video content is still the main form of engagement. This is important since such content often involves little interaction, which may hinder the formation of mutual communication and critical thinking (Fig. 5C). Conversely, educational and social apps were used less, suggesting underutilization of platforms with possible developmental value. This disequilibrium could be a factor in late development and cognition and language in children who are heavily dependent on entertainment media.

(D) Timing of Smart Device Use

Use of smart devices was most common in the evening, next in the afternoons, and mornings, and least in the late night hours. The evening peak was significant statistically ($p < 0.01$, repeated measures ANOVA). The excessive use during the evening hours can coincide with significant routines like family interaction, physical activity, and sleep preparation—factors critical to neurodevelopmental regulation. Evening screen use has also been associated with sleep hygiene and behavioral dysregulation, both of which are frequently seen in children with or at risk for ASD (Fig. 5D). The low prevalence of night time use could be a sign of successful parental control, but the evening peak is an important window to intervene.

Emotional Reactions of Children After Smart Devices Are Taken Away

(A) Child Response After Removing Smart Devices

Parental accounts of children's response to the removal of smart devices indicated diverse emotional reactions. The most common reaction was "acute reaction" (43%), then "angry" (27%), "accepting" (18%), and "rejecting" (12%). The frequency distribution indicates a statistically significant preference for negative emotional reactions ($p < 0.001$, Chi-square test), reflecting intense behavioral dependence on digital devices by a significant portion of children (Fig. 6A). Acute responses—possibly involving tantrums, distress, or aggression—are especially troubling, as they might indicate features similar to dysregulated emotional regulation or compulsive behavior, which have been earlier linked to screen overexposure and developmental delays. These results imply that intervention approaches should gradually temper screen use and enhance emotion regulation, especially in at-risk children for ASD-like behaviors.

(B) Specific Talent/Skills of Child

The parent-report analysis of special skills or talents in children found that a minority showed significant specific abilities, whereas the majority did not. The bar graph displays a lower rate of reported talent (some 22%) than children with no specific talent or skill development observable (some 78%), a statistically significant difference ($p < 0.01$, binomial test) (Fig. 6B). Although this does not necessarily indicate a cognitive impairment, it can indicate limited exposure to diverse stimuli, shorter time spent on creative, social, or motor-based play, and more screen time substituting for skill-building activities. For research on ASD, this trend is useful, as decreased exploratory activity and intense interests can coincide with neurodevelopmental symptomatology. It further suggests the need to evaluate how environmental factors like screen exposure may inhibit natural talent exploration and cognitive engagement.

Table 2
Screen Time Exposure and Behavioral Outcomes Related to ASD-Like Symptoms.

Parameter	Findings / Associations
Smart Device Usage	92% of children use smart devices
Daily Screen Time	> 3 hrs/day: Most common; <1 hr/day: Least common
Purpose of Use	Entertainment > Learning > Watching Videos > Games > Communication
Time of Use	Evening > Afternoon > Morning > Late Night (p < 0.01)
Parental Perception of Isolation	74% reported increased child isolation with device use
Communication Improvement	62% reported occasional improvement only; 18% reported clear improvement
Emotional Reaction on Device Removal	Acute: 43%, Angry: 27%, Accepting: 18%, Rejecting: 12%
Specific Skills or Talents	22% showed talents; 78% had none (p < 0.01)
Most Used App	YouTube > Games > Education Apps > Cartoons > Social Media
Parental Education and ASD Awareness	University-educated majority; low awareness of ASD despite education levels

Table 2 shows some of the major findings that point to the behavioral and developmental implications of excessive screen use among children in the Al-Baha region. Interestingly, an astonishing 92% of children were found to use smart devices, with most using them for over three hours a day—far beyond internationally accepted levels for healthy screen use. The common application of devices for entertainment alone, especially passive forms of activity like viewing YouTube, reflects a trend of digital consumption that is non-interactive and potentially inhibits cognitive and social maturation. The evening hours were the time when screen time was highest, which was a key window typically devoted to family interaction, exercise, and bedtime routines—factors with which neurodevelopmental regulation depends. These patterns of use are highly related to troubling behavioral consequences: 74% of parents indicated greater social isolation during device use, and emotional dysregulation when devices were taken away (e.g., acute responses and anger) was present in 70% of children, indicating potential screen media dependency.

Additional behavioral findings from the table illustrate that although 62% of parents confirmed occasional improvement in communication via smart devices, just 18% witnessed persistent improvement, leaving room for skepticism regarding the effectiveness of screens in developing language (Table 2). Additionally, just 22% of children were reported to have shown particular talents or skills, which could be an indication of less involvement in exploratory and creative activities because of extended exposure to screens. App usage statistics indicated a clear preference for YouTube, followed by games and learning content, which implies that children are mostly watching passive or leisure content and not

educational content. Notably, even though there was high parental education level—most having university degrees—the awareness of ASD was low, which indicates an important digital parenting literacy gap. Together, these results suggest a robust correlation between overuse of screen time and ASD-like symptoms, supporting the imperative for public health interventions targeted to digital literacy, early screening, and behavioral treatments to offset neurodevelopmental risks.

Discussion

This research offers essential insights into the correlation between smart device use and ASD-like behavior in children of the Al-Baha region in Saudi Arabia. Our results establish a very high rate of smart device use (92%) in children, and extended screen exposure is associated with higher behavioral and developmental issues like social withdrawal, emotional dysregulation, and communication problems—characteristics most commonly linked to ASD. Notably, despite having been reported by a mere 15% of study participants, some significant proportion of the children revealed signs of ASD-like symptoms. This implies the potential impact of non-genetic, environmental circumstances, particularly the screen, in determining ASD-like symptoms in such individuals. Such an observation follows those Alrahilli et al. (2021) to the extent that over exposure to screens as a young age relates to higher difficulty in carrying out social communications areas on measures of ASD (Alrahili et al., 2021).

Our findings show that children use smart devices primarily for entertainment, then for educational activities. This is consistent with earlier findings suggesting passive screen use (e.g., watching YouTube videos) is more closely linked to developmental delay than interactive or learning content (Guellai et al., 2022). This is supported by our own findings that the most accessed application was YouTube, followed by educational apps and social utilities. Greater device use was strongly linked with increased emotional reactivity during device removal, such as acute reactions (43%) and anger (27%). These results align with previous work by Radesky et al. (2023), which proposed that screen addiction could be associated with deficits in emotional regulation and tantrum-like behaviour (Radesky et al., 2023). These trends can overlap with repetitive and restricted behaviors seen in ASD children, again obscuring clinical differentiation between neurodevelopmental disorder and behavioral dependency.

Additionally, 74% of parents reported increased isolation during times when children spent time on smart devices, substantiating fears that screen time decreases face-to-face interaction—a foundational aspect of social development. On the other hand, just 18% of parents reported improvement in communication during device use, while 62% reported that improvements were achieved only "sometimes." These contrasting results highlight the complex effect of screen time, where content consumed, parental participation, and environment of use dramatically affect developmental paths (Panjeti-Madan and Ranganathan, 2023).

The duration of screen use also deserves consideration. Our data suggest that screen use is most prevalent during the evening—a critical developmental time for physical activity, family interaction, and sleep. Evening exposure to screens has been found to interfere with circadian rhythms and lower sleep

quality, both of which are linked with irritability, inattention, and ASD-like symptoms (Alshoaibi et al., 2023).

Interestingly, a relatively low proportion of children (22%) were reported to exhibit specific talents or skills, raising concerns about reduced exploratory behavior and play—crucial components of healthy development. This lack of skill development may reflect time displacement caused by screen use, where time spent on unstructured digital content replaces creative, motoric, or cognitive engagement. Prior literature similarly highlights that screen time can displace opportunities for spontaneous learning and talent discovery in early childhood (Melchior et al., 2022). Additionally, sociodemographic factors too had a moderating effect. Most parents were university-educated, yet knowledge gaps in autism still existed, and this indicates awareness does not automatically equate with early detection or regulation of behaviors. This brings to the forefront the need for specific parental educational campaigns to enhance digital parenting tactics, as promoted by the World Health Organization guidelines on screen time exposure in toddlers (Khowaja et al., 2015).

Our research also identified that children with no siblings, and children not in school, might be more susceptible to overuse of screens. This is consistent with literature suggesting that peer and social interactions—typically mediated through school and sibling activity—can act as buffers against overdependence on digital technology (Qi et al., 2023).

Strengths and Limitations

One of the strengths of this research is that it utilizes a large, regionally representative sample with a validated, bilingual questionnaire. Nevertheless, the study has limitations in its cross-sectional nature, which makes causal inference impossible. The study also used parent-reported measures of behavioral outcomes, which could result in reporting bias. Despite the limitations, our results provide strong evidence to regulate early screen exposure and enhance ASD awareness.

Abbreviations

ANOVA: Analysis of Variance; ASD: Autism Spectrum Disorder; SEM: Standard Error of the Mean; SPSS: Statistical Package for the Social Sciences.

Declarations

Ethics approval and consent to participate:

The study received ethical approval from the Al-Baha University Ethical Committee. Only 243 respondents gave informed consent to participate were included in the final analysis.

Consent for publication:

Consent for publication was asked before start from all participating individuals.

Competing interests:

Author declare that the authors have no competing interests as defined by Springer, or other interests that might be perceived to influence the results and/or discussion reported in this paper.

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Author Contribution

Syed Ikramul Hasan design the study . He collect and analyse the data . He also wrote the main manuscript text and prepared figures .

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Data Availability

All data supporting the findings of this study are available within the paper and its Supplementary Information.

References

1. 5 (2024) Saudi Arabia - Digital Economy [WWW Document]. URL <https://www.trade.gov/country-commercial-guides/saudi-arabia-digital-economy-0> (accessed 4.29.25)
2. Almaqhawi A, Albarqi M (2022) The effects of technology use on children's physical activity: a cross-sectional study in the Eastern province of Saudi Arabia. *J Med Life* 15:1240–1245. <https://doi.org/10.25122/jml-2022-0148>
3. Alrahili N, Almarshad NA, Alturki RY, Alothaim JS, Altameem RM, Alghufaili MA, Alghamdi AA, Alageel AA (2021) The Association Between Screen Time Exposure and Autism Spectrum Disorder-Like Symptoms in Children. *Cureus* 13:e18787. <https://doi.org/10.7759/cureus.18787>
4. Alshoaibi Y, Bafil W, Rahim M (2023) The effect of screen use on sleep quality among adolescents in Riyadh, Saudi Arabia. *J Family Med Prim Care* 12:1379–1388. https://doi.org/10.4103/jfmpc.jfmpc_159_23

5. Autism [WWW Document] n.d. URL <https://www.who.int/news-room/fact-sheets/detail/autism-spectrum-disorders> (accessed 4.29.25)
6. Casanova MF, Constantino JN, Ecker C, Frye RE, Martinez-Cerdeño V, Rossignol DA, Scherer SW (2024) Neurobiology of Autism Spectrum Disorder. In: Tasman A, Riba MB, Alarcón RD, Alfonso CA, Kanba S, Lecic-Tosevski D, Ndeti DM, Ng CH, Schulze TG (eds) *Tasman's Psychiatry*. Springer International Publishing, Cham, pp 777–814. https://doi.org/10.1007/978-3-030-51366-5_32
7. Dell'Osso L, Massoni L, Battaglini S, De Felice C, Nardi B, Amatori G, Cremone IM, Carpita B (2023) Emotional dysregulation as a part of the autism spectrum continuum: a literature review from late childhood to adulthood. *Front Psychiatry* 14:1234518. <https://doi.org/10.3389/fpsy.2023.1234518>
8. Guellai B, Somogyi E, Esseily R, Chopin A (2022) Effects of screen exposure on young children's cognitive development: A review. *Front Psychol* 13:923370. <https://doi.org/10.3389/fpsyg.2022.923370>
9. IBM SPSS Statistics 25 Brief Guide, n.d
10. Khowaja MK, Hazzard AP, Robins DL (2015) Sociodemographic Barriers to Early Detection of Autism: Screening and Evaluation Using the M-CHAT, M-CHAT-R, and Follow-Up. *J Autism Dev Disord* 45:1797–1808. <https://doi.org/10.1007/s10803-014-2339-8>
11. Melchior M, Barry K, Cohen D, Plancoulaine S, Bernard JY, Milcent K, Gassama M, Gomajee R, Charles M-A (2022) TV, computer, tablet and smartphone use and autism spectrum disorder risk in early childhood: a nationally-representative study. *BMC Public Health* 22:865. <https://doi.org/10.1186/s12889-022-13296-5>
12. Muppalla SK, Vuppalapati S, Reddy Pulliahgaru A, Sreenivasulu H (2023) Effects of Excessive Screen Time on Child Development: An Updated Review and Strategies for Management. *Cureus* 15:e40608. <https://doi.org/10.7759/cureus.40608>
13. Panjeti-Madan VN, Ranganathan P (2023) Impact of Screen Time on Children's Development: Cognitive, Language, Physical, and Social and Emotional Domains. *MTI* 7, 52. <https://doi.org/10.3390/mti7050052>
14. Peng X, Xue Y, Dong H, Ma C, Jia F, Du L (2024) A study of the effects of screen exposure on the neuropsychological development in children with autism spectrum disorders based on ScreenQ. *BMC Pediatr* 24:340. <https://doi.org/10.1186/s12887-024-04814-y>
15. Qi J, Yan Y, Yin H (2023) Screen time among school-aged children of aged 6–14: a systematic review. *glob health res policy* 8:12. <https://doi.org/10.1186/s41256-023-00297-z>
16. Radesky JS, Kaciroti N, Weeks HM, Schaller A, Miller AL (2023) Longitudinal Associations Between Use of Mobile Devices for Calming and Emotional Reactivity and Executive Functioning in Children Aged 3 to 5 Years. *JAMA Pediatr* 177:62–70. <https://doi.org/10.1001/jamapediatrics.2022.4793>
17. Yenkovyan K, Mkhitarian M, Bjørklund G (2024) Environmental Risk Factors in Autism Spectrum Disorder. *ANarrative Rev CMC* 31:2345–2360. <https://doi.org/10.2174/0109298673252471231121045529>

18. Yland J, Guan S, Emanuele E, Hale L (2015) Interactive vs passive screen time and nighttime sleep duration among school-aged children. Sleep Health 1:191–196.
<https://doi.org/10.1016/j.sleh.2015.06.007>

Figures

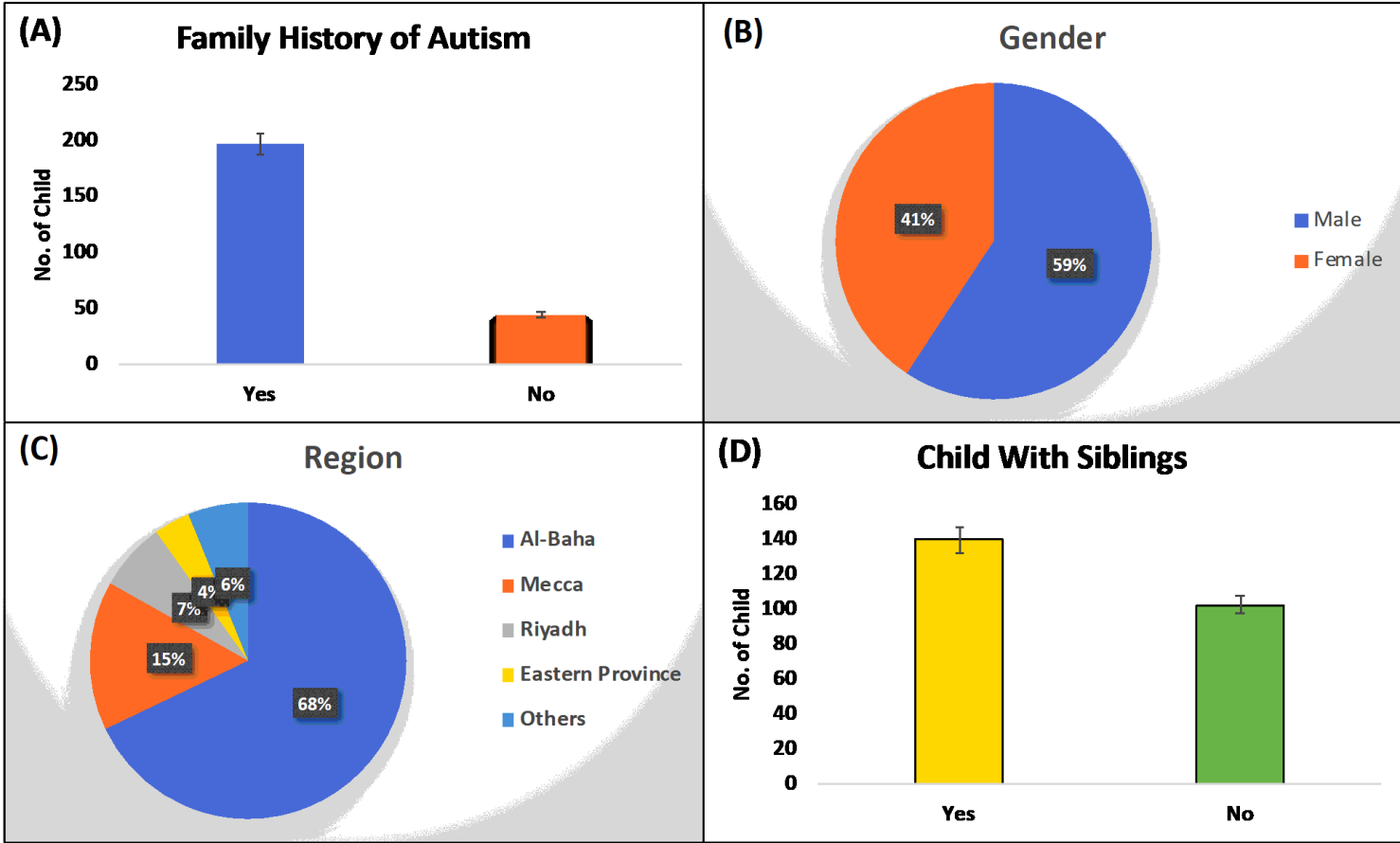


Figure 1

Demographic and Family Background Characteristics of Study Participants in Screen Time and Autism Spectrum Disorder-Like Symptoms in the Al-Baha Region (N=243). (A) Participants' distribution according to family history of autism spectrum disorders (ASD), with most having no reported family history. (B) Gender distribution among participants, with a higher percentage of males (59%) than females (41%). (C) Geographic distribution of the participants, where the majority were from the Al-Baha region (68%), followed by Mecca (15%), Riyadh (7%), Eastern Province (4%), and other regions (6%). (D) Comparison between children with and without siblings, with an increased number of children with siblings. Error bars indicate standard errors of the mean (SEM) where indicated. Statistical analysis was done using Chi-square and t-tests, with significance at $p < 0.05$.

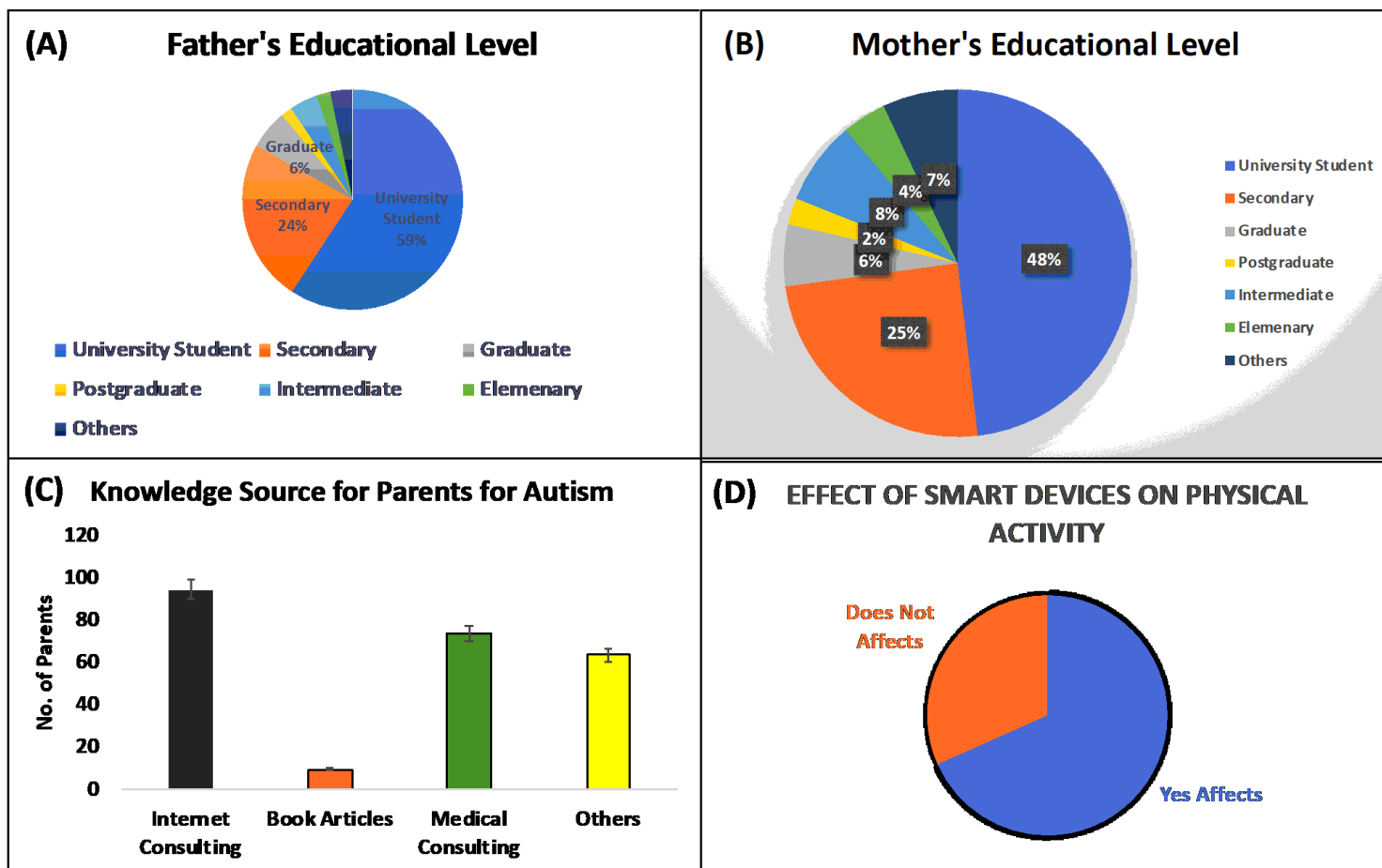


Figure 2

Parental Educational Background, Autism Awareness, and Perceived Impact of Smart Device Use on Physical Activity Among Children in the Al-Baha Region.

(A) Distribution of fathers' educational levels among participants, with the majority being university students (59%), followed by secondary (24%), graduate (6%), postgraduate (4%), intermediate (3%), elementary (2%), and others (2%). (B) Educational level of mothers, where the university-educated level was most prevalent (48%), followed by secondary (25%), intermediate (8%), postgraduate (7%), graduate (6%), elementary (4%), and others (2%). (C) Knowledge about ASD, broken down by level of education, with the highest among postgraduates and the lowest among the secondary or less educated groups. (D) Perceived impact of smart device use on physical activity, in which most (about 70%) indicated that it has a negative impact on physical activity, and 30% felt that there was no impact. Error bars are for SEM where appropriate. Statistical significance was evaluated using Chi-square and ANOVA tests with a cut off at $p < 0.05$.

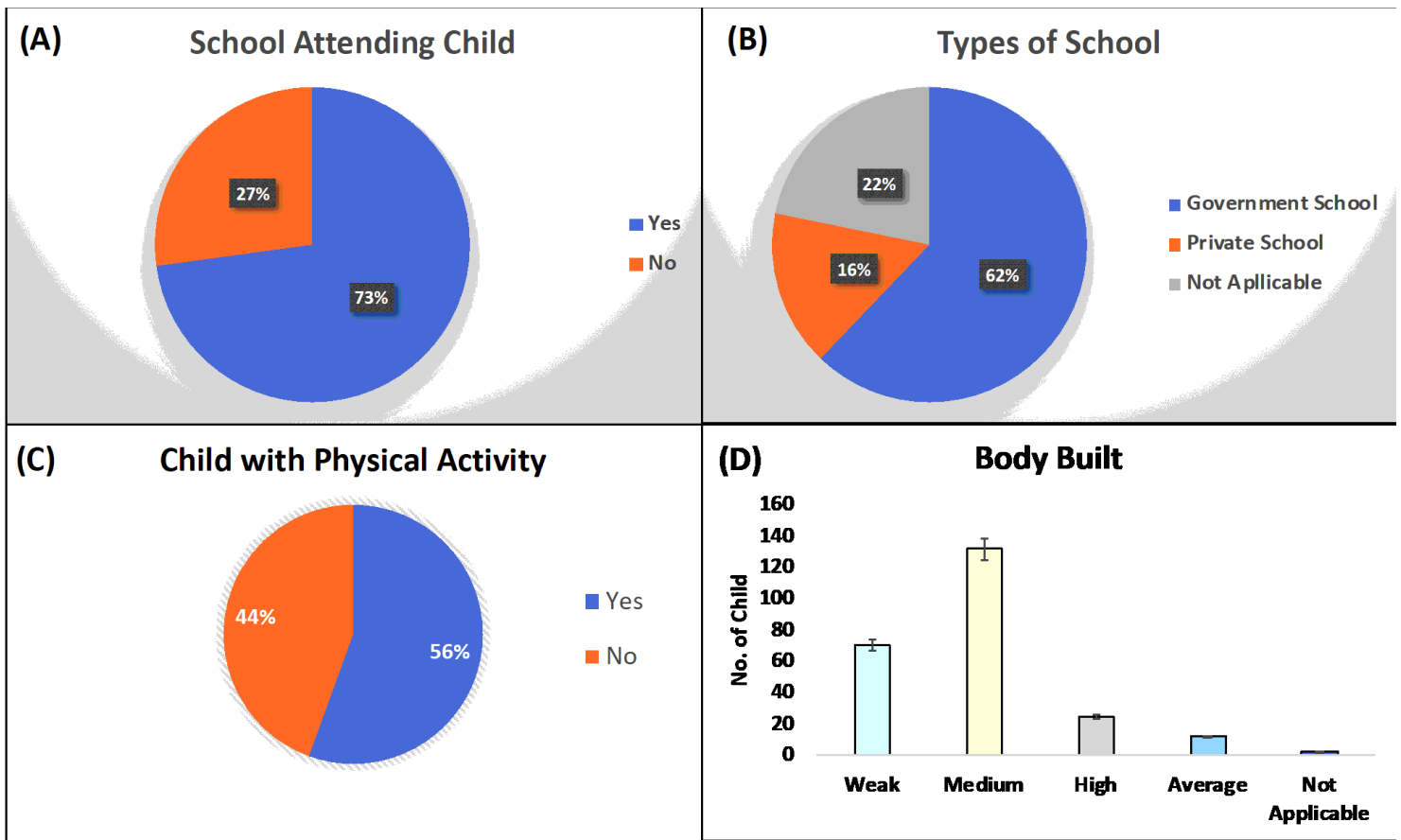


Figure 3

School Enrolment , School Environment, Physical Fitness, and Body Build Type of Al-Baha Region Children Associated with Autism Spectrum Disorder-Like Symptoms. (A) Percentage of children present at school, indicating that 73% were present at school and 27% were absent. (B) School type where enrolled children studied, with 62% in government schools, 16% in private schools, and 22% as not applicable (non-school-going children). (C) Distribution of children according to participation in physical activity, with 56% engaging in physical activity and 44% not engaging. (D) Body build category among the children, "Normal" body build being most common, followed by "Thin," "Overweight," "Obese," and "Very Thin." Error bars on the bar charts are SEM. Statistical analysis was by Chi-square and ANOVA test, where $p < 0.05$ was considered statistically significant.

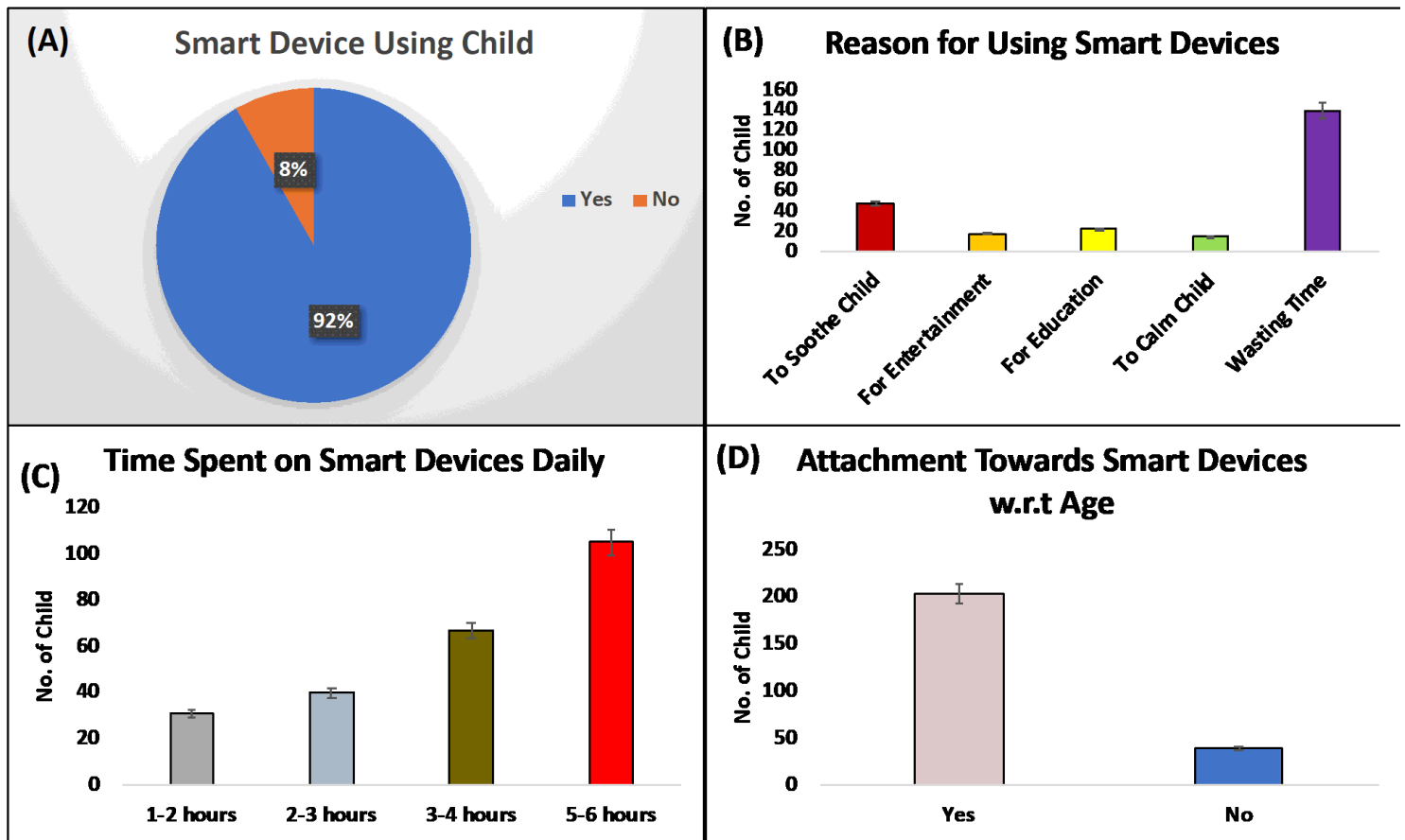


Figure 4

Children's Patterns of Smart Device Usage and Its Behavioral Consequences in the Al-Baha Area. (A) Frequency of smart device usage by children, with 92% of respondents indicating device use and 8% reporting no use of any smart device. (B) Motives for smart device use, with "Entertainment" being the most frequent, followed by "Learning," "Watching Videos," "Games," and "Communication." (C) Number of hours per day spent on screens by children, with the largest percentage of participants reporting 3 or more hours per day on smart devices, followed by 2–3 hours, 1–2 hours, <1 hour, and none. (D) Age-related variation in attachment to smart devices, with higher degrees of attachment in more mature children than younger children. SEM is represented by the error bars. Statistical comparison between groups was carried out using Chi-square, ANOVA, and linear regression analyses, where $p < 0.05$ was statistically significant.

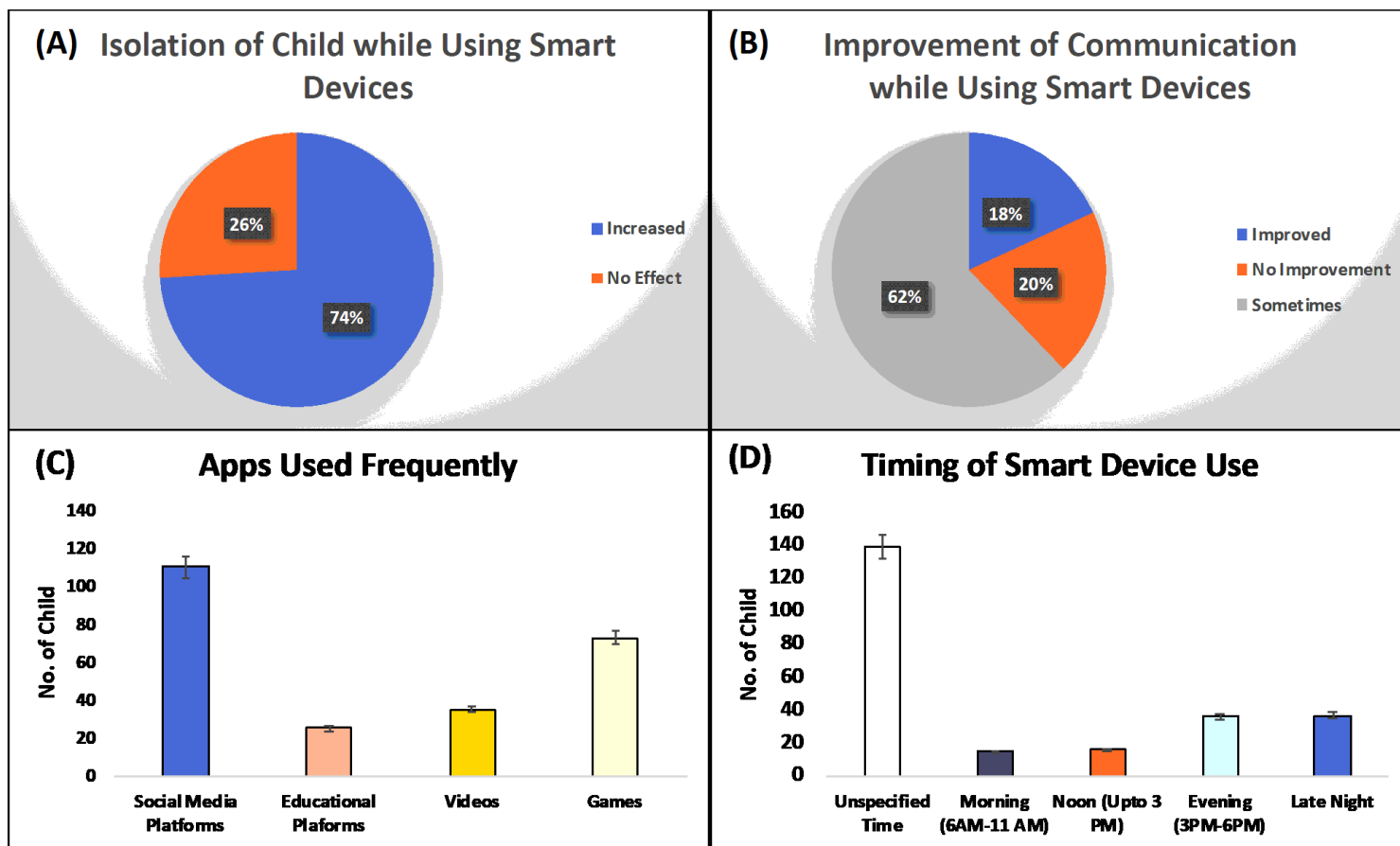


Figure 5

Behavioral Effects of Smart Device Use among Children: Social Isolation, Communication Changes, App Preferences, and Timing of Use within the Al-Baha Region (A) Parental perceptions of children's isolation behavior when using smart devices, with 74% indicating increase and 26% indicating no effect. (B) Reported improvement in communication skills when using smart devices, with 18% indicating improvement, 20% indicating no improvement, and 62% indicating occasional improvement. (C) Most common types of apps used by kids, with YouTube topping the list, then games, education apps, cartoons, and social media. (D) Most common time of smart device use, with highest use during evening, then afternoon, morning, and night. Error bars indicate SEM. Statistical significance was determined by Chi-square tests and ANOVA, with p-values < 0.05 being significant.

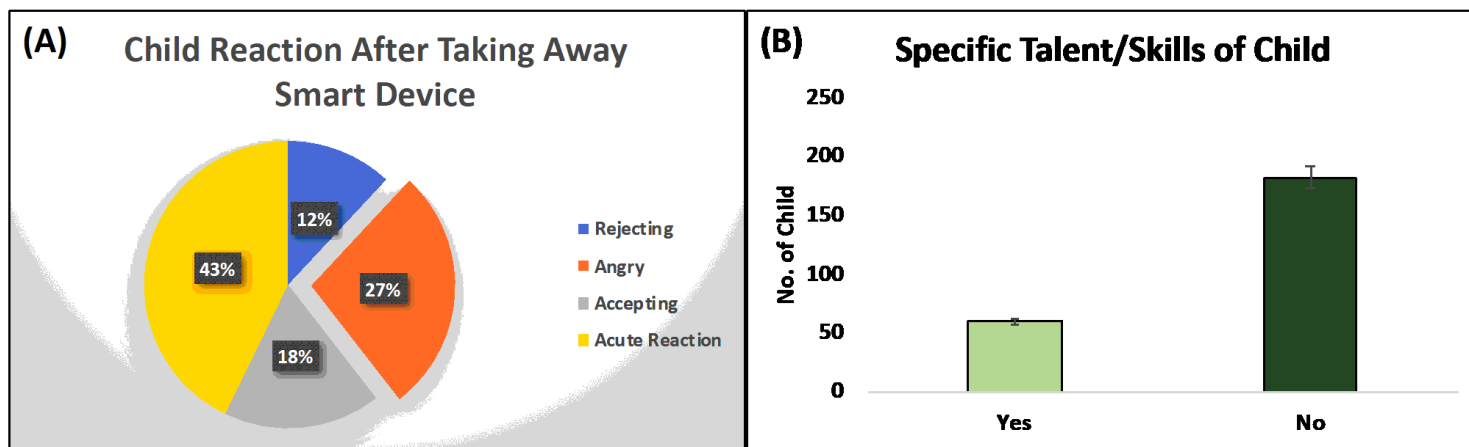


Figure 6

Emotional Response to the Removal of Smart Devices and Possession of Specific Talents Among Children from Al-Baha. (A) Frequency of emotional responses of children upon removal of smart devices. The most prevalent response was acute reaction (43%), followed by anger (27%), acceptance (18%), and rejection (12%). These data indicate a high rate of behavioral dependence on digital devices. (B) Parent indication of presence in children of individual skills or abilities. A small fraction (roughly 22%) were categorized as having obvious abilities, and a larger percentage (78%) showed no observed talents. Error bars indicate SEM. Statistical tests involved Chi-square and binomial proportion tests, with p-value < 0.05 taken as statistically significant.