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Screen time and speech and language delay in children aged 12–48 months in UAE: a case–control study

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Abstract

Background To identify impact of screen time on speech and language development in preschool children. There has been an alarming increase in the use of electronic devices among preschool children despite their potential adverse effects on childhood development during this crucial time of rapid brain development. Prior research has identified the potential risk and benefits of traditional screen media such as television and video. Our findings will help your readers understand the potential impact of screen time between traditional and new technologies. The case–control study included 227 new patients with language delay and 227 normal children, aged 12–48 months male and female. Language delay was diagnosed by reviewing language milestones and Receptive–Expressive Emergent Language Test (RELT). Television viewing variables and child/parental characteristics between both groups were interviewed. Odds ratio was used to establish whether screen time using either electronic devices (smartphones and tablets) or TV viewing has an effect on speech and language development. Chi-square test was used to establish the association between categorical variable 95%. A *P*-value less than 0.05 was considered to be statistically significant.

Result A total of 90.3% of those who have speech and language developmental delay use electronic devices. Odd ratio is found to be statistically significant.

Conclusion The factors that predict language delays include use of and early onset of using an electronic device at 12–24 months of age. The factors that were less likely associated with language delays are watching TV and the mother's education level.

Keywords Speech and language developmental delay, 12–48 months, Screen time, UAE

Introduction

Language development begins in utero, and the first cry after birth is considered the first means of communicating needs that an infant has. The amount of caregiver response will draw the attachment relationship for normal social and emotional development. However, speech and language development milestones are a sensitive and critical period when language is rapidly acquired and environmental stimulation and linguistic input from caregivers aid language acquisition. We live in a digital era, and exposure to visual and verbal media stimulation encompasses language development, and the

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rapid advances in device manufacturing and diversity of devices and applications have led to a dramatic increase in the possession and the use of portable devices.

Screen time is the time spent using a device such as a computer, television, iPad, or mobile device. Exposure to digital media in the last decade is increasing considering the advancement in technologies. Since the 1970, the age at which the child first begin to exposed and interact with media screen has been lowered from 4 years to 4 months making children born as digital naïve [1].

Exposure to digital media is increasing and has led to concerns about the impact on child development. There has been an increasing interest in the link between media viewing and language development. Therefore, it is important to understand the relationship between screen time use and the language development of preschool children.

Furthermore, the American Academy of Pediatrics (AAP) guidelines stated that children below the age of 2 years should not have any screen exposure, and screen time of 3 h per day is considered excessive among children aged 2–5 years [2].

Excessive screen media use according to the recommendation of WHO was defined as follows: children aged 0–12 months exposed to media devices or children aged 2–7 years exposed to screen media use more than 1 h/day. Furthermore, UK guidelines set out by the National Institute for Clinical Excellence (NICE) recommend no more than 2 h of leisure screen time per day for children of any age.

However, families continue to exceed the hours of viewing recommended by the American Academy of Paediatrics (AAP). Gupta et al. have highlighted in a review that there is a high prevalence of excessive screen time among under-five children in the high- and middle-income countries. There are several health impacts of excessive screen time including emotional, sleep, and behavioral issues impairing the growth and cognitive development of under-5 children [3].

Systematic review by Chao Li et al. confirms that excessive screen time, mainly engaging in more than 2 h of daily screen time, has various health indicators in physical, behavioral, and psychosocial aspects [4].

The consequences of excessive screen time have garnered considerable attention in research, health, and public debate over the past decade [5]. This has led to an increasing interest by pediatric societies in the link between media viewing and language development. Therefore, understanding the relationship between screen time and language development of preschool children is important within child health and development.

Nathanson et al. found that TV viewing has a positive effect on the linguistic and cognitive development

of children [6]. There have also been reports that it has a harmful effect on cognitive abilities, including attention and reading [6–11].

Zimmerman et al. have reported positive parental perception of screen time might explain early exposure to screen. Parents believed that screening media (e.g., television, DVD, video), if appropriately used, is educational and useful to their child's brain development [12]. Dutch et al. published a longitudinal study of 119 Hispanic toddlers and found that families overwhelmingly believed (84%) that baby DVD and educational TV shows have a positive effect on their children's learning [13].

Kabali also found that most children had their own tablet by age 4, which is a remarkable uptake of technology considering that in 2013, ownership of mobile devices among children aged 0 to 8 years was in the single digits nationwide [14].

Chonchaiya and Pruksananonda found that children who started watching television at lesser than 12 months of age and watched television more than 2 h per day were approximately six times more likely to have language delays [15]. Population-based studies continue to show negative impact between excessive television viewing in early childhood (0–2) years and cognitive development [16–18], language development [12, 19], and social/emotional delays [20–23]. These delays are likely secondary to decreases in parent-child interactions when the television is on, as well as decreased family functioning in households with high media use [24].

Nathanson et al. found an earlier age of media use onset, and greater cumulative hours of media use are all significant independent predictors of poor executive functioning in preschoolers [6].

However, there have also been reports that there is no significant correlation between TV watching time and the linguistic ability of Thai infants and toddlers [25]. Therefore, further studying the impact of TV viewing is needed.

Epidemiological studies that can represent the general population are required. We live in a digital era where electronic devices are quickly becoming the preferred media choice for children because of their screen size, mobility, and ability to stream content and interactive capability [14]. Hence, it is important to study the impact of early adoption and use of those devices on children development.

However, research on screen time using other electronic devices and speech and language delay has lagged behind the adoption of these technologies. This study, as far as we know, is the first study to identify the impact of screen time including TV, smartphones, and tablets on speech language development in children aged 12–48 months in UAE.

This study addresses three elements in studying the association between screen time and delayed language development: (a) both TV viewing and other electronic devices (smartphone and tablets), (b) age of first exposure to the screen, and (c) association with other variables including parent's education, the onset of using electronic devices, child ownership of devices, the onset of TV viewing, TV viewing hours per day, and the child and parent interactions.

Methods

Study design

This is a case-control study comparing the screen time use in children with speech and language delays to that of typically developing children.

Participants

From January 2018 to January 2019, children, aged between 12 and 48 months old with language delay who came for the first time to pediatric clinic were assessed by clinical history taking, and performing physical examination, head circumference measurement, observation of child's play, language, cognitive ability, sociability, repetitive, hyperactive behavior, joint attention, and hearing screening were performed by developmental pediatricians. We excluded participants who had language delay due to ASD, known genetics causes, hearing problems, cerebral palsy, neurological disorder, and global developmental delay. Therefore, 227 new patients with language delay were included in the study. A child and adolescent psychiatrist and speech and language pathologist interviewed caregivers during the next visit in order to complete the data. Parental consent was obtained from all participants.

Cases were age and gender matched with 227 typically developing children control subjects who were recruited from the Well Baby Clinic in Ambulatory Health Services.

The questionnaire consisted of questions about the child age and gender, parents marital status, education level and mother employment, child screen time (age child first starts watching TV and using electronic devices, number of hours spend in screen time (TV viewing/electronic devices), child favorite program/apps, and lastly parent-child quality time spent (questionnaire in Appendix).

Diagnosis of delayed language development

Children were diagnosed with language delays based on the Receptive-Expressive Emergent Language Test and early signs of language and speech disorders. A delay of 25% or greater by age 16–24 months is considered important. For example, a 24-month-old child who functions as

a typical 18 month old is considered to have a clinically important language delay [26].

Data analysis

Data were analyzed using SPSS 21.0. Categorical data are expressed as the frequency with the corresponding percentage. A chi-squared test established the difference between categorical variables. An odds ratio established whether the screen playtime using either an iPad or watching TV (exposure) affects speech and language development. A *P*-value of less than 0.05 is considered statistically significant for all tests.

Odds ratio analyses compared the probability that children with and without language delay had been exposed to the risk factors defined above. To determine the relationship between all significant risk variables, categorical data were expressed as the frequency with the corresponding percentage. For all binary risk variables, odds ratios were estimated using unconditional logistic regression. Each run of this statistical analysis provided a chi-squared test result. Multivariate logistic regression modeling was performed to determine the relationship between all significant risk variables and language development. Given the large number of variables, the analyses were adjusted for multiple comparisons by multivariate logistic regression modeling. Adjusted odds ratios and their corresponding 95% confidence intervals were calculated from the logistic regression model.

Results

Our sample included 277 children who had language delays and 277 controls with normal language development. Both groups were age and gender matched. In our sample, 37.0% of the children were younger than 24 months of age, 36.1% were 24 months old or older, and 26.9% were 37 months old or older. There was a relatively high proportion of males (54.2%) in both the case and control groups. The distribution of UAE nationals (37.9%), non-UAE national Arabs (28.6%), and non-UAE national non-Arabs (33.5%) was consistent in the control group. However, this distribution was uneven in the case group (*P*-value < 0.001): 49.3% of the subjects were UAE nationals, 35.2% non-UAE national Arabs, and 15.4% were non-UAE national non-Arabs. Married parents accounted for 99.6% of the control group compared to 93.8% of the cases. Divorced/separated/widowed parents were more common among cases than controls (6.2% vs. 0.4%), a statistically significant difference (*P*-value < 0.001). Table 1 shows the sociodemographic data of the case and control groups.

Table 2 shows the number and percentage of individual factors in the case and control groups, along with the binary logic regression and crude odds ratio and the

Table 1 Sociodemographic of cases and controls

Group Variables	Case N = 277	Control N = 277	p-value
Child characteristics			
Age (months)			
12–24	84 (37%)	84 (37%)	
25–36	82 (36.1%)	82 (36.1%)	1.000
37–48	61 (26.9%)	61 (26.9%)	
Gender			
Female	104 (45.8%)	104 (45.8%)	1.000
Male	123 (54.2%)	123 (54.2%)	
Number of children			
1	52 (22.9%)	62 (27.3%)	
2–4	149 (65.6%)	139 (61.2%)	0.542
> 4	26 (11.5%)	26 (11.5%)	
Nationality			
UAE national	112 (49.3%)	86 (37.9%)	
Non-UAE national Arab	80 (35.2%)	65 (28.6%)	< 0.001
Non-UAE national non-Arab	35 (15.4%)	76 (33.5%)	
Parental characteristics			
Marital status			
Married	213 (93.8%)	226 (99.6%)	< 0.001
Divorced/separated/widow	14 (6.2%)	0.1 (0.4%)	
Mother education level			
Intermediate	6 (2.6%)	0.1 (0.4%)	
High school	53 (23.3%)	44 (19.4%)	0.083
Diploma/bachelor	154 (67.8%)	159 (70%)	
Master/PhD			
Father education level			
Intermediate	6 (2.6%)	6 (2.6%)	
High school	46 (20.3%)	57 (25.1%)	
Diploma/bachelor	115 (50.7%)	134 (59%)	0.006
Master/PhD	60 (26.4%)	30 (13.2%)	
Mother employment			
Employed	102 (44.9%)	108 (47.6%)	
Nonemployed	123 (54.2%)	116 (51.1%)	0.750
Self-employed	0.2 (0.9%)	0.3 (1.3%)	

corresponding confidence interval. Significant differences existed between the two language groups when the confidence intervals for the odds ratios did not include an odds ratio of 1.0.

The following factors are significantly correlated (statistically and clinically) with language delay among children: those who use a device [OR 6.82 (4.09–11.40), P -value < 0.001], early onset of using electronic devices (12–24 months) (OR 8.22 (1.71–39.55), P -value = 0.009), and fewer TV viewing hours per day, at 3 to 4 h and 5 to 8 h (OR 2.67 (1.65–4.32), P -value < 0.001) and (OR 4.93 (1.90–12.79), P = 0.001), respectively. The following

factors were protective against developing a speech and language delay: mother's education level of master's degree or PhD (OR 0.1 (0.01–0.93), P -value = 0.043) and watching TV (OR 0.32 (0.21–0.49), P < 0.001).

Although spending time with children was not found to be a significant factor in reducing speech delays, spending 1 to 4 h a day with children protects against speech delays [for 1 to 2 h, OR = 0.379 (0.21–0.67), P = 0.001; for 3 to 4 h, OR = 0.355 (0.20–0.62), P < 0.001]. No significant association was found between the father's education level and possession of a device.

Table 3 shows multiple logistic regression with an adjusted odds ratio and the 95% confidence interval. The factors that could predict a language delay include owning a device, early onset of using electronic devices, and total TV viewing hours per day. Children who own a device are at an increased risk of language development problems (OR = 3.94 (1.97–7.84), P -value < 0.001). The late-onset use of electronic devices (at 25–36 months of age) has a positive influence on language development compared to early-onset use (at 12–24 months of age) (OR = 0.32 (0.13–0.82), P -value = 0.017). Children who watch 3 to 4 h of television per day are at increased risk of language problems (OR = 3.21, 95% CI = 1.66–6.17, P -value < 0.001).

Discussion

Prior studies have noted the importance of decreasing screen time. To date, most of the studies on children's screen time have focused on the traditional screen media, such as television and video. In fact, television has dominated screen time studies for the past decade. However, a focus on portable electronic media is needed in light of the pervasive increase in access and the use of modern mobile devices. This study addresses three elements in studying the association between screen time use and delayed language development: (a) both TV viewing and other electronic devices (smartphone and tablets), (b) age of first exposure to screens, and (c) association with other variables, including parent's education, the onset of using electronic devices, child ownership of devices, the onset of TV viewing, TV viewing hours per day, and child-parent interactions.

Our data indicate that those who use electronic devices have a higher risk of delayed speech and language development (OR = 6.83). These results agree with other studies [18, 19].

Dutch et al. found in both cross-sectional and longitudinal analyses that children who watched more than 2 h of television per day had increased odds of low communication scores [19]. In a longitudinal analysis of 259 mother-infant dyads participating in a long-term study related to early child development

Table 2 Risk variables of the case and control group

Variables	Case (%) (N = 227)	Control (N = 227)	OR (95% CI)	p-value
Mother education level				
Intermediate (reference)	6 (2.6%)	0.1 (0.4%)		
High school	53 (23.3%)	44 (19.4%)	0.20 (0.02–1.7)	0.144
Diploma/bachelor	154 (67.8%)	159 (70%)	0.16 (0.01–1.35)	0.093
Master/PhD	14 (6.2%)	23 (10.1%)	0.10 (0.01–0.93)	0.043
Father education level				
Intermediate (reference)	6 (2.6%)	6 (2.6%)		
High school	46 (20.3%)	57 (25.1%)	0.80 (0.24–2.66)	0.725
Diploma/bachelor	115 (50.7%)	134 (59%)	0.85 (0.26–2.7)	0.796
Master/PhD	60 (26.4%)	30 (13.2%)	2 (0.59–6.7)	0.263
Use of devices				
No (reference)	22 (9.7%)	96 (42.3%)		
Yes	205 (90.3%)	131 (57.7%)	6.82 (4.09–11.40)	< 0.001
Onset of using electronic devices				
12–24 months	181 (88.3%)	88 (67.2%)	8.22 (1.71–39.55)	0.009
25–36 months	22 (10.7%)	35 (26.7%)	2.51 (0.48–12.94)	0.270
37–48 months (reference)	0.2 (1%)	0.8 (6.1%)		
Possession of own device				
No (reference)	74 (36.1%)	39 (29.8%)		
Yes	131 (63.9%)	92 (70.2%)	1.33 (0.83–2.13)	0.232
Watching TV				
No (reference)	92 (40.5%)	41 (18.1%)		
Yes	135 (59.5%)	186 (81.9%)	0.32 (0.21–0.49)	< 0.001
Onset of watching TV				
12–24 months	181 (88.3%)	88 (67.2%)	2.44 (0.25–23.78)	0.442
25–36 months	22 (10.7%)	35 (26.7%)	1.03 (0.09–10.97)	0.980
37–48 months (reference)	0.2 (1%)	0.8 (6.1%)		
TV viewing/day (hour)				
1–2 h (reference)	53 (39.3%)	122 (65.6%)		
3–4 h	65 (48.1%)	56 (30.1%)	2.67 (1.65–4.32)	< 0.001
5–8 h	15 (11.1%)	0.7 (3.8%)	4.93 (1.90–12.79)	0.001
> 8 h	0.2 (1.5%)	0.1 (0.5%)	4.60 (0.40–51.87)	0.217
Spending time with children				
Yes (reference)	217 (95.6%)	216 (95.2%)		
No	10 (4.4%)	11 (4.8%)	0.905 (0.37–2.17)	0.823
Activities per day (in hours)				
1–2 h	58 (26.7%)	78 (36.1%)	0.379 (0.21–0.67)	0.001
3–4 h	60 (27.6%)	86 (39.8%)	0.355 (0.20–0.62)	< 0.001
4–6 h	46 (21.2%)	25 (11.6%)	0.937 (0.48–1.83)	0.850
> 6 h (reference)	53 (24.4%)	27 (12.5%)		

TV viewing /day (h): total amount of time that the child actually watched television each day. Spending time with children/day (h): total amount of time that parents spent doing interactive activity with their children each day such as telling stories, reading to them, and playing. OR odds ratio and CI confidence interval. Keywords: Speech and language developmental delay, preschool children, screen time

with unadjusted and adjusted analyses, Tomopoulos et al. found that the duration of media exposure at age 6 months was associated with lower cognitive development at age 14 months (unadjusted: $r = -0.17$, P

< 0.01; adjusted: $\beta = -0.15$, $P = 0.02$) and lower language development ($r = -0.16$, $P < 0.01$; $\beta = -0.16$, $P < 0.01$) [18].

Table 3 Multivariate logistic regression for associations

Variables	Adjusted OR (95% CI)	p-value
Own device (yes)	3.94 (1.97–7.84)	< 0.001
Onset of using electronic devices (25–36 months)	0.32 (0.13–0.82)	0.017
TV viewing/day (3–4 h)	3.21 (1.66–6.17)	< 0.001

TV viewing/day (h): total amount of time that the child actually watched television each day. CI confidence interval. Keywords: Speech and language developmental delay, preschool children, screen time

We found that 90.3% of those who have speech and language development delay use electronic devices. A recent study (van den Heuvel et al.) found a significant association between mobile device use and parent-reported expressive speech delay in 18-month-old children. Each additional 30-min increase in daily mobile media device use was associated with an increased odds of parent-reported expressive speech delay (OR 2.33, 95% confidence interval, 1.25–4.82). No relationship was observed between mobile media device use and other parent-reported communication delays [27].

TV viewing and speech and language developmental delay have very contradictory results; this study found that TV viewing is reducing the risk for speech and language developmental delay (OR = 0.32): 40.5% of children who had speech and language developmental delays do not watch TV. However, previous research showed no association between time spent on television viewing (\geq 2 h per day) and delayed language development at 2 years old [25]. Other work found similar results in a prospective cohort study: Television viewing in infancy does not seem to be associated with language or visual motor skills at 3 years of age [17]. However, such conclusions must be taken cautiously because many other studies found a high association [12, 13, 15, 16, 18, 24, 28].

The results on age at first screen exposure are surprising in light of the mounting evidence on the lack of benefits and potentially negative impact of media exposure in young children.

Our study found that 88.3% of children who were younger than 24 months old were first exposed to screen, which agrees with prior work [24, 27–30]. A possible explanation for the early age of exposure might be a positive parental perception of screen time. This is beyond the scope of our study, but other work assessed parental perceptions on TV viewing and found positive parental perceptions on television viewing toward children's development [25].

One interesting finding is in the area of child ownership of the devices. However, this study did not find an association between owning a device and developmental language delay: 63.9% of children in the case group who

use electronic devices have their own device versus 70.2% in the control group. This result is consistent with the literature [14]: the number of households who own tablets doubled since 2013, reflecting the pervasive nature of digital technology.

This study has been unable to demonstrate whether gender variables are associated with speech and language developmental delay. Chonchaiya and Pruksananonda found that boys were more likely to have language delays (OR = 3.98) [27]. Ruangdaraganon et al. also found a similar association between male gender and delayed language development (OR = 6.9; 95% CI = 1.5–31.3) [25].

This study found a positive influence on language development for mothers with a master's degree or PhD (OR = 0.10), but no association was found with the father's education level. This result seems to be consistent with other research [30] showing that children of high school graduates were more than twice as likely as children of college graduates to watch more television than AAP recommended (OR = 2.3; 95% CI = 1.4–3.9, P = 0.002). However, Chonchaiya and Pruksananonda found that the father's education (\leq at primary school level) was strongly correlated to predict language delays in children (OR = 4.91) [15].

Limitations

Its retrospective design is a limitation of this case-control study. There might be interviewer bias and limitations in the human recall. There was also a lack of measures to determine other important variables, including temperament, interactive activity, and parenting style.

Despite these limitations, however, our study has several strengths. It is the first study to identify the impact of screen time including TV, smartphones, and tablets on speech language development in children aged 12–48 months in UAE. This contribution is important, given the sample size from a diverse multiethnic population, which might improve the generalizability of our findings.

Future direction

A longitudinal prospective study is needed to examine the impact of screen time on speech and language development in children and for better understanding of the possible causality.

Conclusion

The main goal of this study was to determine the impact of screen time via electronic devices or television on speech and language development and the factors that predict language delays. Overall, this study supports the notion that there is a relationship between early onset before the age of 2 years and high frequency of screen

time and delayed language in preschool children. The factors that predict speech and language delay are using a device and early onset of the electronic device. However, the factors found to be less likely associated with speech and language delay are watching TV and the mother having a master's degree or PhD.

Abbreviations

RELT	Receptive-Expressive Emergent Language Test
AAP	American Academy of Pediatrics
NICE	National Institute for Clinical Excellence

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s43045-023-00318-0>.

Additional file 1:

Additional file 2:

Acknowledgements

NA.

Authors' contributions

SS, ED, SA, RS, RM, and AW conceived and designed the study, conducted research, provided research materials, and collected and organized data. SS and EA analyzed and interpreted data. SS, ED, and SA wrote initial and final draft of article. All authors have read and approved final manuscript.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Availability of data and materials

Data available on request from the authors.

Declarations

Ethics approval and consent to participate

The Research Ethics Committee of Sheikh Khalifa Medical City provided ethical approval (REC-07.12.2017 [RS509]). Written informed consent was obtained from the parents.

Consent for publication

Parents signed informed consent regarding publishing their data.

Competing interests

The authors declare that they have no competing interests.

Received: 2 March 2023 Accepted: 11 April 2023

Published online: 09 June 2023

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