



Electronic Media Exposure and Use among Toddlers

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Objective These days, young children are exposed to a wide range of smart devices and their usage of smart devices is rapidly increasing worldwide. However, the use of smart devices by young children has not been studied in detail yet because smart device is relatively recent. The purpose of this study was to investigate the exposure status of smart devices among 2–5 years old children in Korea.

Methods Four hundred parents of 2- to 5-year-old children were invited to enroll. Data on demographic information and the frequency of media use, time of media use, age at first use of media was self-reported.

Results Among 390 toddlers, 39.3% watched TV almost every day, while 12.0% of children used smartphone on a daily basis. During weekdays, 48% of the children watched TV for over an hour. On weekends, 63.1% of the children watched TV for over an hour. On weekends, 23.4% of children use their smartphones for over an hour. Children using smartphones before 24 months of age were 31.3%.

Conclusion Research has shown that TV and smartphones are the most popular digital devices used by toddlers. Most toddlers began using smart devices at 12–24 months. This study provides comprehensive information on children's contemporary use of media.

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Key Words Toddler, Electronic media, Smart device, Exposure.

INTRODUCTION

These days, young children are exposed to a wide range of smart devices (e.g., smartphones and tablet computers) and their usage of smart devices is rapidly increasing worldwide.¹⁻³ Recent results showing that 70–80% of under-fives in the UK use smart devices.⁴ According to Common Sense Media results, 72% of children aged 0–8 used digital tools in 2013, compared with 38% in 2011. The use of children under two years of age increased significantly from 10% in 2011 to 38% in 2013.⁵ In Korea, the rate of use of smart devices is increasing rapidly and the proportion of children and adolescents using such devices is increasing. According to the 'Actual Situation of Infant & Toddler Smartphone Exposure and

Protection Measures' of the Child-Raising Policy Institute, infants and children's smartphone usage rate reached 53.1% by 2013. The average age of first use of smartphones is 2.27, which means that toddlers are already exposed to smartphones before he or she reaches the age of three.⁶ The average amount of time spent on smartphones per day for infants and toddlers was 31.65 minutes.⁷ The increasing amount of time children are spending on smart devices has raised concerns on the impact of these behaviors on their psychological development. However, most of the recent research on children's use of technology focus mainly on school children and adolescents.⁸ According to Holloway et al., the use of smart devices by young children has not been studied comprehensively, because the introduction of smart devices is relatively recent and their usage are difficult to evaluate.^{9,10} Recognizing the rapidly changing use patterns of digital media use is important in determining how digital media is affecting children's lives. It is the most rudiment stage in understanding the impact of smart devices. The purpose of this study was to investigate the exposure status of smart devices (exposure time, content, initiation of first exposure) among 2–5 years old children.

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METHODS

Study setting and study sample

This research is a part of the Internet-Cohort for Understanding of internet addiction Risk factors/Rescue in Early livelihood (I-CURE) study. The I-CURE study is the first long term observational prospective cohort study that investigated the causes of internet-related diseases and disorders in children and adolescent.

After a detailed presentation on the design and purpose of the survey, 400 parents of 2- to 5-year-old children were invited to enroll their children in the study. All families involved in the survey gave their written informed consent and participated in the study voluntarily. All participants who completed the survey received individual evaluation results. Data were collected between December 1, 2015, through June 30, 2016 from the Suwon, Koyang, Sungnam city in Gyeonggi-do, Korea. Subsequently, the families of 390 children (97.5% of those consenting) provided sufficient data to be included in the I-CURE study. The study was approved by the Institutional Review Board at the University of Ajou, School of Medicine (AJIRB-SBR-SUR-14-378).

Demographic factors

Parents reported their child's gender and their birthdate, main caregiver, family structure, maternal and paternal education level and employment status, and family income.

Media measures

Household media ownership

Respondents were asked if they had the following six types of media: smartphone, television, computers (e.g., desktops and laptops), tablet PC (e.g., iPad: Apple Inc., Cupertino, CA, USA; Galaxy Tab: Samsung Corp., Seoul, Korea), video consoles (e.g., Xbox: Microsoft, Redmond, UT, USA; PlayStation: Sony Corp., Tokyo, Japan), and portable device (e.g., Nintendo DS: Sony Computer Entertainment Inc., Tokyo, Japan).

Media use

Respondents were asked to report children's frequency of use of media. Response options were "never," "less than once a week," "1-2 days a week," "3-4 days a week," "5-6 days a week," and "almost every day." The data on average time their children spent on the media during the past month were also collected. The answers were divided into weekday and weekend. The response categories were none, 1 hour, 1-3 hour, 3-5 hours, 5 hours and up. Additionally, to evaluate children's age at first use, we asked parents, "How old was your child when she/he first did various activities on a media?" Response op-

tions were "0-11 month," "12-23 month," "24-35 month," "36-47 month," "48-59 month."

Data analysis

All statistical analyses were conducted using SAS version 9.3 (SAS Institute Inc., Cary, NC, USA). Missing data, representing unanswered questions, were not used in the data analysis. Frequency responses and percentages were obtained for each question and set of questions.

RESULTS

Demographics

The children had a mean age of 3.85 ± 0.7 (M \pm SD) ages. Slightly more than half of the included sample (52.3%) was boys. In most of the cases, the main caregiver was the mother (93.8%). Majority of parents have received over 12 years of education (Mothers 87.4%; fathers 88.2%). Descriptive data are shown in Table 1.

Frequency of media use

Table 2 presents descriptive statistics regarding household media ownership and frequency of media use. Almost all households had televisions (94.6%), personal computer (90%), tablet PC (48.21%) and smartphones (95.9%). On the other hand, only a minority of household had video consoles (14.6%), portable game devices (10.0%). Smartphone has penetrated 95 percent of all households. 39.3% of the children watched TV almost every day. 12.0% of children used smartphone on a daily basis. 26.5% of the children were using smartphones more than 3 days a week, and more than 70% of the children watched TV more than 3 days a week.

Time of media use

Table 3 presents descriptive statistics regarding time using the devices.

The time spent on media is increased on weekends compared to weekdays. During the week, 48% of the children watch TV for over an hour. On weekends, 63.1% of the children watched TV for over an hour. During the week, 9.7% of children use the smartphone for more than an hour. On weekends, 23.4% of children use their smartphones for over an hour.

Age at first use of media

In the case of television, about 65% of children were exposed before 24 months. Before the age of 12 month, 12.2% of children were using smartphones for the first time. 31.3% of the children were using smartphones before 24 months of age (Table 4).

Table 1. Demographics of participants

	Total (N=390)
Age	
2	15 (3.9)
3	120 (30.8)
4	164 (42.1)
5	91 (23.4)
Gender	
Boys	204 (52.3)
Girls	186 (47.7)
Main caregiver	
Mother	363 (93.8)
Father	1 (0.3)
Grandparents	19 (4.9)
Other relatives	2 (0.5)
Else	2 (0.5)
Family structure	
Both parents with child	345 (88.5)
One parent with child	5 (1.3)
Grandparent(s) with child	1 (0.3)
Grandparent(s) plus both parents with child	36 (9.2)
Grandparent(s) plus one parent with child	3 (0.8)
Father's education level	
≥12 years	343 (88.2)
9–11 years	42 (10.8)
<9 years	3 (0.8)
Else	1 (0.3)
Mother's education level	
≥12 years	341 (87.4)
9–11 years	46 (11.8)
<9 years	2 (0.5)
Else	1 (0.3)
Father's employment status (N=386)	
Day laborer	3 (0.8)
Employee	65 (16.9)
Owner-operator	54 (14.0)
Office worker	151 (39.1)
Middle manager	76 (19.7)
Professional/ senior manager	21 (5.4)
Artist/ religion worker	10 (2.6)
Housewife/ no employment	6 (1.6)
Mother's employment status (N=389)	
Day laborer	2 (0.5)
Employee	14 (3.6)
Owner-operator	21 (5.4)

Table 1. Demographics of participants (continued)

	Total (N=390)
Office worker	58 (14.9)
Middle manager	7 (1.8)
Professional/senior manager	26 (2.7)
Artist/ religion worker	13 (3.3)
Housewife/no employment	248 (63.8)
Income per month	
<₩1,000,000	6 (1.5)
₩1,000,000–2,000,000	20 (5.1)
₩2,000,000–4,000,000	172 (44.1)
₩4,000,000–6,000,000	124 (31.8)
≥₩6,000,000	68 (17.4)

Data represent N (%)

DISCUSSION

There has been a lack of empirical research on the exposure of smart devices for infants and toddlers. This is the first study to investigate the full range of media use of young children in Korea. In Korea, which has seen remarkable technological advances over the last few decades, electronic media devices have become more accessible and personalized. This study examined the use patterns of smart devices among children aged 2–5 years of age in community. As a result of the study, the majority of children lived in home environments using different digital devices and media.

Research has shown that TV and smartphones are the most popular digital devices used by children. TV viewing is considered as a passive activity that negatively affects cognition, physical and social development.¹¹ In this study, 39% of the toddlers used TV almost every day. On weekend, many children watched TV for more than an hour. In case of smartphones, on weekends, 23.4% of toddlers used their smartphones for over an hour. 31.3% of the children were using smartphones before 24 months of age.

The results are similar to other studies conducted in Korea.¹² According to Hong's research, the average daily TV watching time of 2-year-old toddlers was 1.21 hours, and 32.6% of toddlers watched TV for more than 2 hours. This result is also similar to those of other countries. A study conducted in the Czech reported that children watched TV for an average of 1.2 to 1.5 hours per day. All participants spent more time on the media during weekends than on weekdays. On weekdays, children averaged less than 1 hour on average, and spent more than 78 minutes on weekends.¹³ In the UK, screening time for 5–6 year-old children was also found to use media for much more time on weekends than on weekdays.¹⁴

Compared to the previous study, the viewing time of the tele-

vision is decreasing and the use time of the smart device is increasing gradually, the initiating age of the smart devices use is getting younger.⁶ According to a study conducted in Korea (2013), the time to start using smartphones was 2.27 years. 56.9% of toddlers were watching TV every day and 14.8% of toddlers were using smart devices every day.⁶ Although both studies differ in methodology and overexposure questions, the use of TV in toddlers is gradually decreasing, and the use of smart devices including smart phones is gradually increasing.

This tendency appears in the US and Europe, but it is showing up at high speed in Korea, where 98% of the population owns smartphones. As new media is integrated into children's lives, the time spent watching TV has slowed down over the last 20 years. Using data from the National Health and Nutrition Examination Survey (NHANES) between 2001 and 2012, the average time spent watching TV among preschool children was significantly reduced.¹⁵ On the other hand, the use of mobile devices (smartphones and tablet computers)

Table 2. Usage frequency of devices in toddlers

	Owns the device	Usage frequency					
		Does not use at all	<1 day/week	1-2 days a week	3-4 days a week	5-6 days a week	Everyday
TV	369 (94.6)	32 (8.3)	25 (6.5)	52 (13.4)	69 (17.8)	57 (14.7)	152 (39.3)
Computer	351 (90.0)	241 (62.6)	71 (18.4)	40 (10.4)	23 (6.0)	5 (1.3)	5 (1.3)
Tablet PC	188 (48.21)	264 (67.7)	33 (8.5)	35 (9.0)	22 (5.6)	17 (4.4)	19 (4.9)
Smartphone	374 (95.9)	61 (15.9)	79 (20.6)	103 (26.9)	66 (17.2)	28 (7.3)	46 (12.0)
Video	57 (14.6)	373 (95.9)	7 (1.8)	6 (1.5)	2 (0.5)	0 (0.0)	1 (0.3)
Portable game device	39 (10.0)	385 (99.0)	2 (0.5)	2 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)

Data represent N (%)

Table 3. Hours using the devices in toddlers

	Does not use at all	Less than 1 hour	1-3 hours	3-5 hours	More than 5 hours
During the weekday					
TV	66 (17.1)	135 (34.9)	163 (42.1)	19 (4.9)	4 (1.0)
Computer	298 (77.2)	73 (18.9)	15 (8.9)	0 (0.0)	0 (0.0)
Tablet PC	293 (75.7)	69 (17.8)	24 (6.2)	0 (0.0)	1 (0.3)
Smartphone	133 (34.8)	212 (55.5)	34 (8.9)	3 (0.8)	0 (0.0)
Video	383 (99.0)	2 (0.5)	2 (0.5)	0 (0.0)	0 (0.0)
Portable game device	387 (99.5)	2 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)
During the weekend					
TV	45 (11.8)	96 (25.1)	158 (41.4)	65 (17.0)	18 (4.7)
Computer	289 (74.5)	66 (17.0)	26 (6.7)	6 (1.6)	1 (0.3)
Tablet PC	288 (74.4)	61 (15.7)	31 (8.0)	6 (1.6)	1 (0.3)
Smartphone	92 (24.2)	200 (52.5)	81 (21.3)	6 (1.6)	2 (0.5)
Video	373 (95.6)	12 (3.1)	4 (1.0)	1 (0.3)	0 (0.0)
Portable game device	385 (99.2)	3 (0.8)	0 (0.0)	0 (0.0)	0 (0.0)

Data represent N (%)

Table 4. Starting age of devices in toddlers

	Does not use yet	0-11 months old	12-23 months old	24-35 months old	36-47 months old	48-59 months old
TV	32 (8.3)	104 (26.9)	153 (39.6)	42 (10.9)	28 (7.3)	27 (7.0)
Computer	241 (62.4)	11 (2.8)	25 (6.5)	41 (10.6)	43 (11.1)	25 (6.5)
Tablet PC	264 (68.4)	4 (1.0)	23 (6.0)	42 (10.9)	34 (8.8)	19 (4.9)
Smartphone	61 (16.2)	46 (12.2)	118 (31.3)	74 (19.6)	39 (10.3)	39 (10.3)
Video	373 (96.1)	1 (0.3)	4 (1.0)	2 (0.5)	4 (1.0)	4 (1.0)
Portable game device	385 (99.0)	0 (0.0)	0 (0.0)	1 (0.3)	1 (0.3)	2 (0.5)

Data represent N (%)

by young children has increased dramatically since the Kaiser Family Foundation began research into the use of technology for parents of 0- to 8-year-olds.³ In 2011, 52% of children aged 0–8 were able to access mobile devices, but by 2013 they increased to 75%.⁵

Smart devices are becoming increasingly popular in the homes of young children.¹⁶ Touch-based multi-modal interface smart device provides an easy-to-use platform for young children, especially when compared to a mouse that require fine motor and keyboard techniques. The impact of smart devices on the physical, cognitive, and social development of young children is limited for a number of reasons.¹⁷

Many studies have shown that excessive screen time for young children is associated with language delay, attention problems, obesity, aggressive behavior, sleep problems.^{4,10,18,19} In addition, screen time habits formed at young childhood can later predict negative psychological and health outcomes in life.^{20–22} Thus, building appropriate screen time habits in young children can have a significant impact on their health and well-being throughout their lifetime. Factors affecting screen time for school-aged children and adolescents may not be relevant to young children's group because early developmental stages are distinct periods. Early use of media, increased cumulative time of media usage, and media content are all important independent predictors of poor executive functioning.²³ Because directional reactions to new stimuli are very strong for young children, they pay attention to the attractive and fast-changing features of smart devices such as animation, sound, and highlighting.¹³ However, these features can decrease the comprehension of young children.²⁴ There is little research on media use for preschool children. However, when young children play video games or use the computer, they use these media for just under an hour, which is not a trivial amount of time in a young child's day. The results of this survey clearly show that young children are growing in environments exposed to media. According to one study in the United States,²⁵ 90% of children have already started watching television by age 2, and a Canadian survey shows that 25% of 2–5 year olds watch TV for more than 2 hours each day. In this study, too many children are exposed to TV and smart device before 24 months.

The findings of this study cannot be generalized to overall population because of the relatively small sample size and largely homogenous SES backgrounds. Also, current survey data is based on a questionnaire written by parents, which may be vulnerable to socially undesirable biases. Future research will provide more reliable data by directly observing the use of electronic and measuring screen time in the homes.

In order to provide a stronger rationale for the screen time guidelines, we must consider the broader factors that affect

use of smart devices, such as parent factors, environment, and child's factors.

In recent years, over-exposure to smart devices has become an important area in the public mental health field. The majority of children spend more time watching screen media than ever before. Despite concerns about overuse of smart devices by children, research on Asian countries is very limited. Most smart device overexposure studies are being conducted in the US and Europe. The findings do not examine the impact of smart devices on children and families. They simply describe the characteristics and usage patterns of smart device exposure. Although TV is still the most common type of screen device that exposes children, this research shows that smartphones are the second most commonly used screen media in addition to TVs. Research shows that over the weekend, TV viewing and smartphone usage are particularly high, so weekend can be an important goal in mediation to reduce screen time. To encourage healthy screen habits from childhood, doctors and mental health professionals should educate parents about the impact that media exposure can have on their children and be aware of their importance.

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