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# Maternal Depression and Children's Screen Overuse

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## ABSTRACT

**Background:** It is known that there are various factors associated with children's screen overuse. The aim of this study was to examine the effect of maternal depression on 2–5-year-old children's overuse of various household screen devices.

**Methods:** Participants were from the Internet-Cohort for Understanding of internet addiction Risk factors/Rescue in Early livelihood (I-CURE) study, an observational prospective cohort study in Korea. Screen time for six types of screen devices (smartphone, television, computer, tablet, video gaming console, and portable gaming console) were assessed by parental questionnaire. Maternal depression was measured by the Korean version of the Beck Depression Inventory II. Logistic regression models were run to determine the association between maternal depression and children's screen overuse.

**Results:** Maternal depression was associated with children's television overuse after adjusting for other factors (odds ratio, 1.954;  $P = 0.034$ ). Contrary to expectation, the relationship between maternal depression and screen time was not present on other devices such as smartphones, computers and tablets.

**Conclusion:** Maternal depression is related with 2–5-year-old children's television overuse. Interventions in maternal depressive symptoms and the associated changes in parent-child relationship can be useful for preventing children's television overuse.

**Keywords:** Maternal Depression; Screen Overuse; Television; Smartphone; Computer; Tablet

## INTRODUCTION

Children today are exposed to various and ubiquitous screen media devices.<sup>1</sup> There is no exception on this trend among young children, and the age of initial exposure to devices is becoming younger; at present, exposure begins at early infancy.<sup>2</sup> In Korea, 38% of infants aged less than 11 months had been exposed to screen media and the average time of their screen exposure is about 2.4 hours per day.<sup>3</sup> There is a considerable amount of discussion on the consequences of screen exposure on school-aged children and adolescents. Excessive screen use has been associated with aggressive behavior,<sup>4</sup> social and peer problems.<sup>5</sup> However, there are comparatively few studies on preschool-aged children, because the widespread exposure to screen media devices is relatively recent; assessing the use of screen by young children is difficult.<sup>6</sup> In addition, there is growing evidence that young children

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**Author Contributions**

Conceptualization: Park S, Shin YM. Data curation: Chang HY, Yoo HJ, Kim S. Formal analysis: Kim S. Methodology: Park S, Chang HY, Park EJ, Jo W. Writing - original draft: Park S, Shin YM. Writing - review & editing: Chang HY, Jo W, Shin YM.

interact with screen differently than older children.<sup>7</sup> Preschool-aged children who are not yet in their teens are the first generation to have been influenced by the omnipresence of media devices since birth. Moreover, the limitations of physical and cognitive functions of young children affect screen usage pattern.<sup>8</sup>

Nevertheless, certain studies have addressed the effect of screen exposure on preschool-aged children. The excessive screen media use of infants and toddlers has been found to possibly lead to behavioral problems,<sup>3</sup> cognitive impairment and poor family functioning in the long term.<sup>9</sup> Livingstone<sup>10</sup> pointed out that the use of digital screen devices by young children, who lack the appropriate technical, critical, and social skills, poses a greater risk. Considering these adverse effects, the American Academy of Pediatrics (AAP) recommends that the screen time of 2- to 5-year-old children must be limited to an hour per day.<sup>11</sup> Therefore, it is important to understand what factors affect young children's television viewing habit. A perspective focused on preschool-aged children is needed for early and adequate intervention. Previous studies have also indicated the necessity for longitudinal or age group-based research.<sup>8,12</sup> Young children's screen use is influenced by various factors; it is more directly dependent on family environment, such as parental guidance, than school-aged children.<sup>13</sup>

In keeping with this demand, an observational prospective cohort study has begun for a longitudinal investigation of the use of screen media devices for children in Korea, which is among the leading countries of media accessibility. As part of the cohort, this study is conducted to explore the exposure status and related factors of the use of screen media devices among 2- to 5-year-old children.

It is known that maternal depression has diverse effects on child-parental relationship, attachment, family functioning, and poor child outcomes.<sup>14,15</sup> For example, children of depressed mothers are more likely to have greater social impairment<sup>16</sup> and depressive symptoms.<sup>17</sup> Because these changes that children experience can affect their media use,<sup>12</sup> it is reasonable to expect that maternal depression may influence children's screen time. However, relatively little attention has been given to the association between maternal depression and screen time in young children.<sup>18</sup> In line with this, our study hypothesized that young children with depressed mothers would be more likely to overuse screen media devices than those with non-depressed mothers. As this study was specifically aimed at 2- to 5-year-old children, it could contribute to designing an early intervention and verify its future effectiveness.

## METHODS

### Participants

This study used data from 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 investigating the causes and effects of internet-related diseases and disorders in children and adolescents in Korea. Based on the I-CURE cohort, studies have been conducted on children's smartphone and Internet game addiction.<sup>19,20</sup> A population-based sample of 400 children aged 2 to 5 years from three cities (Suwon, Goyang, and Seongnam) in Gyeonggi-do, Korea was recruited and consented to participate. All parents gave written informed consent and participated voluntarily. Data were collected between December 1, 2015 through June 30, 2016. Subsequently, the parents of 380 children (95% of those consents) provided sufficient data to be included in our study.

### Depression measure

Maternal depression was measured by the Korean version of the Beck Depression Inventory II (K-BDI-II), a 21-item self-report depression questionnaire. In this study, women with high BDI scores ( $\geq 22$ ) were regarded as depressed mothers, considering previous study on the general population<sup>21</sup> and excluding false positives that have little effect on the actual behavior change.

### Media use measure

Parents were asked to report whether they owned the following six types of media devices: smartphone, television, computers (including laptops), tablet computers, video gaming consoles (e.g., Microsoft Xbox, Sony PlayStation), and portable gaming devices (e.g., Nintendo DS, Sony PlayStation portable). Subsequently, the average amount of screen time that children spent on each type of media during the past month was obtained. Using the screen for more than 1 hour per day was classified as screen overuse. This cut-off value was in accordance with the current AAP recommendations for 2- to 5-year-old children.<sup>11</sup>

### Covariates

Parents reported their child's gender and birthdate, from which the child's age was calculated. Familial structure and socioeconomic level was assessed by parents' report including child's main caregiver, parental education and employment status, and monthly household income.

### Statistical analysis

First, to determine the sociodemographic factors that related with a high K-BDI-II score, we compared the frequency of the K-BDI-II positive rate between sociodemographic subgroups using  $\chi^2$  test, applying Fisher's exact test if expected cell values were below five. Second, using screen overuse for each device as the main outcome, we performed multivariable logistic regression analysis with independent variables including sociodemographic variables and depression. We used odds ratios (ORs) and 95% confidence intervals (CIs) for screen time and covariates. All statistical analyses were conducted using SPSS version 24 (IBM Corp., Armonk, NY, USA).

### Ethics statement

The study was approved by the Institutional Review Board at the Ajou University School of Medicine (AJIRB-SBR-SUR-14-378). Informed consent was obtained from all participants when they were enrolled.

## RESULTS

### Participants' demographics and screen use characteristics

**Table 1** presents the demographic data and screen use status of 380 participants. Nearly all the children (94.2%) were cared for mainly by their parents. Most parents obtained college education. Half of the respondents had a monthly household income of above KRW 4,000,000, which is close to the median household income of KRW 4,222,533 in Korea in the same year (2015).<sup>22</sup> Almost all households owned televisions (94.7%), smartphones (95.8%), and computers (90.3%). In contrast, about half of the households owned tablets (48.2%), and only a few of them had video game consoles (14.7%) and handheld game consoles (10.0%). Slightly less than half of the enrolled children overused (i.e., more than one hour a day) televisions (48.4%). Only a few of the children overused smartphones (10.0%), tablets

**Table 1.** Characteristics of participants

Characteristics	No. (%)
Age, yr	
2	58 (15.3)
3	167 (43.9)
4	116 (30.5)
5	39 (10.3)
Sex	
Male	198 (52.1)
Female	182 (47.9)
Main caregiver	
Parents	358 (94.2)
Grandparents	19 (5.8)
Paternal education	
High school or below	41 (10.8)
College or above	339 (89.2)
Maternal education	
High school or below	41 (10.8)
College or above	337 (88.7)
Paternal employment status	
Unemployed	5 (1.3)
Employed	375 (98.7)
Maternal employment status	
Unemployed	244 (64.2)
Employed	136 (35.8)
Monthly household income, KRW	
< 4,000,000	190 (50.0)
≥ 4,000,000	190 (50.0)
Ownership of media devices	
Television	360 (94.7)
Smartphone	364 (95.8)
Tablet	183 (48.2)
Computer	343 (90.3)
Video game console	56 (14.7)
Handheld game console	38 (10.0)
Screen overuse (≥ 1 hr/day)	
Television	184 (48.4)
Smartphone	38 (10.0)
Tablet	24 (6.3)
Computer	15 (3.9)
Video game console	2 (0.5)
Handheld game console	0 (0.0)

(6.3%), computers (3.9%), and video game console (0.5%). None of the children overused handheld game consoles.

### Comparison between depressed and non-depressed mother groups

Fifty-six (14.7%) mothers of participants scored positively on the K-BDI-II. The children's age, sex, main caregiver, parental employment status, and monthly household income between the two groups showed no significant difference. Depressed mothers and their spouses tended not to receive higher education than their counterparts. Also, depressed mothers tended to have monthly household income of less than KRW 4,000,000 than non-depressed mothers (Table 2).

### Association between maternal depression and children's screen overuse

Table 3 presents the association between children's screen overuse and variables, such as maternal depression or sociodemographic factors on logistic regression. The screen overuse

**Table 2.** Comparison between depressed mother group and non-depressed mother group

Characteristics	Non-depressed mother (n = 324)	Depressed mother (n = 56)	$\chi^2$	P value
Age, yr			2.306	0.511
2	49 (15.1)	9 (16.1)		
3	141 (43.5)	26 (46.4)		
4	103 (31.8)	13 (23.2)		
5	31 (9.6)	8 (14.3)		
Sex			0.003	0.959
Male	169 (52.2)	29 (51.8)		
Female	155 (47.8)	27 (48.2)		
Main caregiver			0.592	0.755
Parents	304 (93.8)	54 (96.4)		
Grandparents	20 (6.2)	2 (3.6)		
Paternal education			13.779	< 0.001
High school or below	27 (8.3)	14 (25.0)		
College or above	297 (91.7)	42 (75.0)		
Maternal education			4.538	0.033
High school or below	32 (9.9)	11 (19.6)		
College or above	292 (90.1)	45 (80.4)		
Paternal employment status			0.112	0.551
Unemployed	4 (1.2)	1 (1.8)		
Employed	320 (98.8)	55 (98.2)		
Maternal employment status			2.317	0.128
Unemployed	203 (62.7)	41 (73.2)		
Employed	121 (37.3)	15 (26.8)		
Monthly household income, KRW			5.362	0.029
< 4,000,000	154 (47.5)	36 (64.3)		
≥ 4,000,000	170 (52.5)	20 (35.7)		

of video and handheld game consoles was not included in the analysis because the number of participants in the video game console (2) and handheld game console overuse (0) group was insignificant (**Table 1**). After adjusting for other variables, positive maternal K-BDI-II was a significant risk factor that almost doubles the risk of children's television overuse (adjusted OR, 1.954; 95% CI, 1.050–3.635). However, such finding was not observed in smartphones, tablets, and computers. A monthly household income of above KRW 4,000,000 was associated significantly and negatively with children's tablet overuse (adjusted OR, 0.257; 95% CI, 0.083–0.800).

## DISCUSSION

This study was conducted to determine the association between maternal depression and children's screen overuse. As expected, children with depressed mothers were more likely to overuse television. This finding is consistent with the previous studies on preschool-aged children's television use.<sup>18,23</sup> Maternal depression is associated with negative parental behavior and weakens child behavior management.<sup>14</sup> It is also clear that such change of parental behavior has a significant impact on children's media use.<sup>12</sup> There are several suggestions on how this effect is mediated. Although this study did not directly measure parental television use, parents' media use is an important determinant of their children's.<sup>12</sup> Parental time spent using screen devices is positively associated with preschool-aged children's screen time.<sup>24</sup> Meanwhile, there are consistent reports indicating that depressed adults tend to spend more time watching television.<sup>25</sup> Depressed mothers may use television as a coping mechanism, relieving their anhedonia and helping them avoid unpleasant emotions and stimuli.<sup>26</sup> Thus, children of depressed mothers watch more television because

**Table 3.** Association between demographic and depression variable and children's screen overuse

Characteristics	Television			Smartphone			Tablet			Computer		
	$\beta$	OR (95% CI)	P value	$\beta$	OR (95% CI)	P value	$\beta$	OR (95% CI)	P value	$\beta$	OR (95% CI)	P value
<b>Depression (K-BDI-II)</b>												
0-21	Ref											
> 22	0.670	1.954 (1.050-3.635)	0.034	0.452	1.572 (0.661-3.739)	0.306	-0.644	0.525 (0.131-2.107)	0.363	0.916	2.499 (0.699-8.933)	0.159
<b>Age, yr</b>												
2	Ref											
3	-0.386	0.680 (0.364-1.269)	0.226	0.600	1.821 (0.679-4.886)	0.234	-0.804	0.447 (0.127-1.576)	0.211	0.122	1.130 (0.219-5.831)	0.884
4	-0.446	0.640 (0.330-1.239)	0.186	-0.591	0.554 (0.163-1.880)	0.343	0.039	1.040 (0.295-3.666)	0.951	-0.938	0.391 (0.051-2.987)	0.366
5	-0.761	0.467 (0.198-1.103)	0.082	-0.837	0.433 (0.078-2.413)	0.340	-0.660	0.517 (0.080-3.319)	0.487	0.664	1.942 (0.287-13.159)	0.496
<b>Sex</b>												
Male	Ref											
Female	0.162	1.176 (0.769-1.800)	0.455	-0.594	0.552 (0.265-1.152)	0.113	-0.568	0.567 (0.221-1.451)	0.236	-0.168	0.845 (0.271-2.636)	0.730
<b>Main caregiver</b>												
Parents	Ref											
Grandparents	0.097	1.102 (0.431-2.820)	0.839	0.188	1.206 (0.227-6.417)	0.826	0.285	1.330 (0.132-13.393)	0.809	0.419	1.521 (0.141-16.406)	0.772
<b>Paternal education</b>												
High school or below	Ref											
College or above	-0.018	0.982 (0.457-2.110)	0.963	-0.517	0.596 (0.219-1.622)	0.311	-0.486	0.615 (0.166-2.276)	0.466	1.022	2.779 (0.294-26.229)	0.372
<b>Maternal education</b>												
High school or below	Ref											
College or above	-0.618	0.539 (0.255-1.140)	0.106	-0.853	0.426 (0.162-1.119)	0.083	-0.883	0.413 (0.131-1.309)	0.133	-0.316	0.729 (0.131-4.062)	0.718
<b>Maternal employment status</b>												
Unemployed	Ref											
Employed	-0.067	0.936 (0.580-1.509)	0.785	0.094	1.099 (0.485-2.492)	0.821	0.048	1.049 (0.380-2.895)	0.926	-0.723	0.485 (0.126-1.863)	0.292
<b>Monthly household income, KRW</b>												
< 4,000,000	Ref											
≥ 4,000,000	-0.018	0.990 (0.629-1.558)	0.964	-0.503	0.604 (0.269-1.356)	0.222	-1.357	0.257 (0.083-0.800)	0.019	0.175	1.191 (0.375-3.776)	0.767

Adjusted with age, sex, main caregiver, maternal education, paternal education, maternal employment status, and monthly household income.  
 OR = odds ratio, CI = confidence interval, K-BDI = Korean Version of the Beck Depression Inventory, Ref = reference.

their mothers also do so. Moreover, depressed mothers tend to think that their children feel more pleasure from television than they can provide.<sup>27</sup> Therefore, it is reasonable to assume that depressed mothers find it hard to reduce their children's television viewing time, because they use television as a babysitter to replace their depressed self.

Maternal depression affects qualitative aspects of parenting and family functioning.<sup>28</sup> Maternal depressive symptoms, such as sadness, loss of energy, and irritability, can affect adversely the effective control of children's behavior and maintenance of positive parent-child attachment.<sup>29</sup> Thus, depressed mothers showed a more negative or coercive parenting behavior and less positive parenting behavior or engagement.<sup>14</sup> Predictably, maternal parenting behavior is related to the amount of time children spend watching television. Low parental engagement is associated with screen overuse in preschool-aged children.<sup>7</sup> Mothers' authoritarian parenting styles are positively associated with their children's television watching time.<sup>30</sup> Authoritarian parents, one of the four classification of parenting styles identified by Baumrind,<sup>31</sup> tend to have less verbal give and take with their children, emphasize obedience without question, and more likely to be angry or critical toward their children. These characteristics are similar to those seen in the parenting patterns of depressed parents.<sup>32</sup> In particular, parenting attitudes that are similar to depressive parenting behaviors, such as less democratic parenting or weak parental attachment, are associated with screen overuse.<sup>33</sup> Hence, it is plausible that the parenting factors of depressed mothers can cause their children's screen overuse.

Contrary to expectations, the relationship between maternal depression and children's screen overuse was not present on other devices, except for television. This is a questionable result because it can be plausibly expected that changes in parental behavior, attachment, and family environment due to maternal depression will have similar effect on other screen devices, aside from television. This discrepancy might be understood in the context of the child's development. As the use of a certain screen device requires an adequate level of physical and cognitive functioning for the device, age-based developmental level of the child affects media usage pattern.<sup>8,12</sup>

Screen devices, such as computers and gaming consoles, require “active” manipulation. Users need to be attentive on the screen and perceive and respond appropriately to the stimuli appearing on the screen. The children must also have enough strength, agility, and motor coordination to handle the input devices, such as mouse devices and keyboards. In other words, children need adequate levels of cognitive and motor development to handle the devices. In the case of smartphones and tablets, motor function is relatively less important; however, the cognitive level of 3.5-year-old children is necessary to understand symbolic and icon-based information display.<sup>34</sup> Meanwhile, television is relatively a “passive” medium and requires less development of motor and cognitive functions. Young children may be exposed to “background” television, where they pay less overt attention to the content of television, unlike in “foreground” exposure.<sup>35</sup>

Because this study was derived from the baseline data collection of the I-CURE cohort, participants in the study were confined to children aged 2 to 5 years. Children in this age group can be too young to use a medium that requires “active” manipulation. According to the common sense media research study, 70% of screen use by children under 8 years old was through watching television or DVD, whereas their use of an “active” medium (e.g., computers, gaming consoles, and mobile devices) was a relatively small portion.<sup>36</sup> In this

study, the overuse rate of other devices except television was less than 10%, suggesting that the association with maternal depression may not be evident because the overuse of “active” devices was exceptional in this age group covered by the study.

Several limitations of this study must be remarked. Children's screen use was measured by parental reporting, which is known to produce little overestimation compared with daily log or direct observation.<sup>37</sup> In addition, K-BDI-II was designed as a screening tool rather than a diagnostic tool; thus, it may not reflect accurately the depressive symptoms of the mother. Current screen overuse can cause various long-term effects as well as predict future screen overuse. Children's electronic media use has a dose-dependent association with an increase in emotional problems and poorer family functioning two years later,<sup>38</sup> and television exposure prior to age 3 is associated with attentional problems at age 7.<sup>39</sup> Moreover, greater television exposure in early childhood is linked to greater television viewing at school age.<sup>40</sup> However, this study is a cross-sectional study, which does not allow inferring any longitudinal causal relations. Subsequent studies based on this cohort are expected to elucidate the trajectory and long-term effects.

This study considers only the effects of maternal depression on the quantitative aspects of screen use. However, maternal depression also affects the qualitative features of children's media use. For example, depressed mothers were less likely to interact with their children during television use or seek information on proper media use.<sup>27</sup> Qualitative factors of screen use, such as children's attention or interaction with parents during television use, can also mediate the effect of children's media use.<sup>35</sup>

This study investigated the relationship between maternal depression and screen overuse in preschool-aged children. Maternal depression (K-BDI-II  $\geq 22$ ) is associated with television overuse in children aged 2 to 5 years but not with smartphones, tablets, and computers. This association may be derived from changes in parent-child relationship, parenting behavior, and family environment due to maternal depression. The reason this association does not appear in smartphones, tablets, and computers seems to be that the participants have not yet reached the level of cognitive and motor development sufficient to use devices that require active manipulation. This study not only provides a basis for future follow-up studies using the I-CURE cohort but also emphasizes that early intervention for maternal depression in young children is important in preventing screen overuse.

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