

The Influence of Parents' Attitudes toward ICT Devices and Media Literacy on Children's Screen Time: Online Surveys of Japanese Parents

Ayumi Sato
Shimane University, Japan
ayumisato@hmn.shimane-u.ac.jp

Kosuke Sato
Bandai Namco Research Inc., Japan
sato.cos135@gmail.com

Tomomi Sato
Aichi Shukutoku University, Japan
satomo@asu.aasa.ac.jp

Hirotsugu Tazume
Kyoto University of Education, Japan,
htazume@kyokyo-u.ac.jp

Hiroshi Hotta
Sonoda Women's University, Japan
hotta@sonoda-u.ac.jp

An online survey examined parent characteristics influencing preschoolers' appropriate use of information and communication technology (ICT) devices, focusing on avoidance of prolonged use of digital media among children. Parent characteristics included positive and negative images of ICT devices, strategies for children when using ICT devices, media literacy, and time spent using ICT devices. Multiple regression analysis indicated parents' media-using time impacted children's media-using time. Cluster analysis and analysis of variance using media literacy-related items indicated parents' media-manipulation skill level, rather than superficial media literacy, influenced children's media-using time. Logistic regression indicated that, among media-manipulation skills, higher skills related to "dissemination" than "receipt" were associated with a higher probability of keeping children's media-viewing time within an appropriate range. These findings suggest that, for children's adaptation to ICT device use, parents should receive not only superficial media literacy but also content that enhances their sense of media control through actual media manipulation.

Keywords: ICT Devices, Media Literacy, Online Survey, Parents' Attitudes, Screen Time

Introduction

In recent years, developments in information technology have increased the exposure of more and younger children to information and communication technology (ICT) devices. Since the hours in the day are limited, many educators, researchers, and parents hope that the time children spend with media will be as beneficial to their development as possible. However, there is a worrying situation in Japan. A report by the National Institute for Educational Policy Research (2018), the OECD Programme for International Student Assessment (2018), notes that Japan spends the least amount of time among OECD countries on the question about the time spent using digital devices in the classroom during the week, especially less in Japanese-language classes. In addition, in response to the question about use for school studies, the use of ICT devices not only at school but also outside of school on weekdays is reported to be lower than the OECD average across the board. On the other hand, Japanese children use ICT devices for playing games and chatting online more frequently than in any other OECD country. In other words, Japanese children do not have many opportunities to obtain useful information such as study from ICT devices, but they do have many opportunities to use ICT devices for entertainment at home. Device use that is more beneficial to their development and education would better contribute to children's development.

It has been noted that the delay in children's educational use of ICT devices is influenced by the attitudes of teachers and other adults toward such devices (Noborimoto & Takahashi, 2021). However, in recent years, since the majority of children are already exposed to ICT devices before they start school (e.g., Benesse Educational Research and Development Institute, 2018), it would seem to be nonsensical to place the responsibility solely on the preschool teacher. Furthermore, since preschoolers spend more time at home and acquire various habits there, it is extremely likely that parents' attitudes toward ICT devices shape their children's habits and attitudes toward them. In addition, since preschoolers spend more time at home for "entertainment and play" than for "learning," it can be inferred that the purpose of ICT device use is inevitably more entertainment-oriented. In light of the above, it is highly likely that the development of a habit of controlling the time spent using ICT devices, which tend to be used for entertainment purposes, at home during the preschool years will promote appropriate use of ICT devices by children after they start school. This is thought to be influenced by parents' awareness of ICT devices.

What are some of the attitudes of parents that influence the amount of time children spend using ICT devices? As it has been reported that teachers' anxiety about ICT devices (Noborimoto & Takahashi, 2021) is behind the slow use of ICT devices in educational settings, it is likely that parents' negative or positive images of ICT devices also have an influence. In addition, since the early preschool period is a time of significant development of self-control that enables children to resist doing what they want to do (Kopp, 1982), the kind of support that parents provide for their children's use of ICT devices may also have an impact. Furthermore, it has been reported that interventions from a parent's media literacy perspective influence the development of children's media literacy (Takahashi & Sagara, 2009); therefore, the degree of parents' media literacy may also influence their children's appropriate interaction with ICT devices. It is thought, then, that the degree of media literacy of parents also influences children's appropriate interaction with ICT devices. Finally, the habits of parents have a significant impact on children's habits, and we thus assume that the parents' own time spent using ICT devices also influences the children's time spent using them.

In light of the above, this study focuses on avoiding "prolonged use" of ICT devices for preschool children and examines the parent characteristics that influence this avoidance. The parents' characteristics include positive and negative images of ICT devices, support for children when using ICT devices, media literacy, and time spent using ICT devices.

Research Design & Methods

Research Design

This study was a nationally representative cross-sectional online survey of the Japanese general population aged ≥ 20 years. In this research, we analyzed data from parents whose first child is a toddler or preschooler between the ages of 1-2 or 3-6.

Sampling and Data Collection

An external research company, Macromill Inc., recruited participants and collected data. Of that company's 2.3 million registered monitor members, those members who were parents meeting the aforementioned criteria were targeted so that data could be collected from as many municipalities as possible throughout Japan. As a result, data were obtained from all 47 prefectures in Japan, with a final total of 1123 parents (331 males and 792 females, mean age 33.95 years, $SD = 5.65$ years). In these participants, 48 (4.3%) were single (including never married, divorced, or bereaved) and 1075 (95.7%) were married.

Development of Questionnaire

Participants were asked to respond to the Positive-Negative Image of ICT Devices, Duration of ICT Device Use, Media Literacy, Media Manipulation Skills, and Strategies for Using ICT Devices with Children Scales. Note that all references to "child" used in this questionnaire refer to the participant's first child, and participants were asked to respond with their first child in mind.

We used the results of the Benesse Educational Research and Development Institute (2018) survey to identify the top advantages and disadvantages to media viewing (using) and to develop the Positive-Negative Image of ICT Devices Scale (15 items). The respondents were asked, "How do you feel about allowing your child to use ICT devices?" and then responded to the above 15 items (e.g., "enjoy singing and dancing" or "prolonged viewing and use") using a 7-point scale ranging from "very much so" to "not at all so."

The Strategies for Using ICT Devices with Children Scales was used to examine the extent to which parents use strategies to encourage their children to interact appropriately with ICT devices. This scale was based on a text-mining study (Sato et al., 2020) in which open-ended descriptions of strategies that promote desirable and discourage inappropriate behaviors when children use ICT devices from parents with children aged 1–2 and 3–6 years old, the same target ages as in this study.

Media Literacy Scale (Goto, 2005) and the Media Manipulation Skills Scale (Goto & Ikuta, 2004) were used to examine parents' media literacy. The media literacy scale was divided into two factors: "critical thinking," in which participants attempted to discern the truth or falsity of information without relying on it, and "proactive attitude," in which participants attempted to select information media appropriately and actively acquire and express information. The critical thinking factor included 10 items, such as "People's way of thinking changes greatly depending on how TV and newspapers report information." The proactive attitude factor included eight items, such as "I would rather search for

what I want to know through books or the Internet than ask people.” Participants responded to these items using a 5-point scale ranging from "agree" to "disagree.”

The media-manipulation skills scale was also divided into three factors: “receipt,” “dissemination,” and “receipt and dissemination” information. The “receipt” factor included four items, such as “putting my favorite websites in my favorites.” The “dissemination” factor included four items, such as “creating documents with word-processing software.” Receipt and dissemination messages included two items, such as “sending and receiving e-mail using a computer or cell phone.” Participants responded to these items using a 4-point scale: “I can and do often,” “I can,” “I can't,” and “I don't know what you are talking about.”

To determine the amount of time children and parents (respondents and their spouses) used ICT devices, we asked how much time they spent using TVs, PCs, tablet devices (e.g., iPad), smartphones (e.g., iPhone), and game consoles. For PCs, tablets, and smartphones, participants were asked how much time they spent using these devices for different purposes, such as watching videos, using social network services (SNS), surfing the Internet (browsing and searching), and playing games. Participants responded about the duration of use by selecting one of the following options: “hardly ever,” “less than 30 minutes,” “30 minutes to less than 1 hour,” “1 hour to less than 2 hours,” “2 hours to less than 3 hours,” “3 hours to less than 4 hours,” “4 hours to less than 5 hours,” or “more than 5 hours.”

Results

The cross-sectional online survey was conducted between March and April 2021. Of the 1123 participants gathered, 2 selected almost “5 hours or more” for the item on time spent using ICT devices. These were excluded from this analysis as they were not considered to have answered the question seriously. In the item about participants' household income, 4.5% selected less than 2 million yen, 16.9% selected 2 to 4 million yen, 28.0% selected 4 to 6 million yen, 18.5% selected 6 to 8 million yen, 11.1% selected 8 to 10 million yen, 4.7% selected 10 to 12 million yen, 1.2% selected 12-15 million yen, 0.4% selected 20 million yen or more, and 14.2% selected "don't know. In the category of participants' occupation, 6.1% were public servants, 0.6% were managers, 14.2% were company employees (clerical), 12.3% were company employees (technical), 14.5% were company employees (other), 1.2% were self-employed, 0.7% were free-lance workers, 35.4% were housewives (househusbands), 12.7% were part-time, 1.2% were Other, and 1.1% were unemployed.

Table 1 shows the media usage time for parents (respondents and their spouses), and their children. Note that children are listed by age, 1-2 years and 3-6 years, and significant differences between ages were examined with an unpaired t-test (two-tailed). The results indicate that, in general, children's frequency of use increases with age, except for TVs in terms of devices, and except for SNS and Internet in terms of purposes.

Table 1

The means and SDs of time spent using each ICT devices for parents and their children and t-test results between child age groups

	respondents (n = 1121)		spouses (n = 1073)		children (n = 1121)				t values
	M	SD	M	SD	1-2 yo (n = 551)		3-6 yo (n = 570)		
					M	SD	M	SD	
Devices									
TVs	3.838	1.810	3.313	1.530	3.828	1.620	3.753	1.450	0.815
PCs	1.393	0.759	1.366	0.783	1.147	0.550	1.226	0.710	2.059 *
tablets	1.283	0.721	1.306	0.716	1.285	0.660	1.414	0.780	2.983 **
smartphones	2.382	0.995	2.427	1.035	1.320	0.660	1.425	0.760	2.466 *
games	1.350	0.896	1.492	1.093	1.138	0.600	1.502	1.100	6.907 ***
Purposes									
videos	1.675	0.744	1.803	0.779	1.518	0.720	1.653	0.810	2.926 **
SNS	1.751	0.764	1.574	0.695	1.157	0.590	1.193	0.690	0.931
Internet	1.873	0.760	1.811	0.732	1.159	0.620	1.219	0.700	1.540
games	1.420	0.689	1.580	0.778	1.162	0.580	1.392	0.730	5.855 ***

Note. *p < .05; **p < .01; ***p < .001. "1-2 yo" means 1-2 years old, "3-6 yo" means 3-6 years old.

As a result of factor analysis (maximum likelihood method) of Oblimin rotation on the positive-negative image scale, three factors were extracted. Factor 1 was called "Positive Image" (alpha coefficient of 0.76) and included five items: "enjoy singing and dancing," "enrich knowledge," "develop expressive skills such as creating and drawing," "useful in learning beyond elementary school," and "increase communication between parents and children." Factor 2 consisted of four items—"too much involvement," "prolonged viewing and use," "bad for eyes and health," and "concern about dependence when children grow up"—and was called "Negative Image (concern about prolonged use)" (alpha coefficient of 0.86). Factor 3 was called "Negative Image (influence on behavior)" (alpha coefficient of 0.79) and

included five items: "disruptive behavior and language," "possible access to pay sites and dangerous sites," "passivity," "reduced parent–child communication," and "disruption of daily rhythm."

An Oblimin rotation factor analysis (maximum likelihood method) was conducted on the findings from the Strategies for Using ICT Devices vs. Children scale, and three factors were extracted. Factor 1 was called "Non-interference" (alpha coefficient of 0.58) because it included the items "show the smartphone or tablet whenever the child wants to look at it" and "the child looks at the smartphone or tablet alone." Factor 2 was called "Discussion" (alpha coefficient of 0.62) and included the items "I suggest and discuss good ways to use smartphones and tablets," "I refer to children's opinions when deciding when to stop using smartphones and tablets," "I explain the bad aspects of smartphones and tablets," and "I set rules such as only allowing children to use smartphones and tablets for a certain time." Factor 3 was called "Guidance" (alpha coefficient of 0.59) and included items such as "suggesting other games when asking the child to stop using the smartphone or tablet," "talking and singing with the child while watching the smartphone or tablet," and "selecting and giving content that seems to be good for the child's upbringing."

The means and SDs for each subscale of the Positive-Negative Image Scale, The Strategies for Using ICT Devices with Children Scales, the Media Literacy Scale, and the Media Manipulation Skills Scale are shown in Table 2.

Table 2

The means and SDs for each subscale of the Positive-Negative Image Scale, The Strategies for Using ICT Devices with Children Scales, the Media Literacy Scale, and the Media Manipulation Skills Scale

	<i>M</i>	<i>SD</i>	<i>min.</i>	<i>max.</i>
Positive-Negative Image Scale				
Positive Image	3.527	0.964	1.000	7.000
Negative Image (concern about prolonged use)	2.336	1.124	1.000	7.000
Negative Image (influence on behavior)	3.304	1.083	1.000	7.000
Strategies for Using ICT Devices with Children Scales				
Non-interference	3.261	0.990	1.000	5.000
Discussion	2.718	0.672	1.000	5.000
Guidance	2.498	0.726	1.000	5.000
Media Literacy Scale				
Critical Thinking	2.498	0.506	1.110	3.670
Proactive Attitude	2.622	0.548	1.000	5.000
Media Manipulation Skills Scale				
Receipt of Information	2.183	0.607	1.000	4.000
Dissemination of Information	1.806	0.613	1.000	4.000
Receipt and Dissemination of Information	1.891	0.705	1.000	4.000

To examine the effect of parental characteristics on children's time spent using ICT devices, multiple regression analysis (stepwise method) were conducted with two factors from the media literacy scale, three from the media manipulation skills scale, three from the positive-negative image of ICT devices scale, and three from the strategies for using ICT devices with children scales as independent variables. The results are shown in Table 3. The multiple regression analysis revealed that the less the negative image of ICT devices (concern about prolonged use), longer TV viewing by the respondent and spouse, the longer time their children spent watching TV.

The duration of smartphone use tended to be shorter the better at dissemination manipulation skills, longer the better the better at receipt and dissemination, shorter the more non-interference the tendency in ICT device use strategies toward children, longer the more negative the image (concern about prolonged use), longer the respondents' and spouses' own smartphone use, longer when the respondents were male, and longer when the children were between 3 and 6 years old.

Cluster analysis (Ward's method) was conducted using the factor scores of the media literacy and media-manipulation skills scales, which affected children's time spent using ICT devices in multiple regression analysis. Five clusters were extracted, and the average of the above factor scores for each cluster is shown in Figure 1. Cluster 1 was called the low-manipulation-skill group because it had medium media literacy but low manipulation skill. Cluster 2 was called the overall-low group because both media literacy and manipulation skills were low. Cluster 3 was called the overall-low-manipulation-skills group because it had low overall and particularly low operating skills. Cluster 4 was called the overall-medium group because it was average overall. Cluster 5 was called the high-manipulation-skills group because of its high media-manipulation skills.

A two-factor analysis of variance ($B \times B$ design) was conducted with the cluster group and children's age as independent variables and children's time spent using ICT devices as the dependent variable. The main effect of cluster was significant for TV-viewing time ($F [4, 1111] = 4.617, p < .01$), but the main effect of age and the interaction were not significant; multiple comparisons using the HSD method revealed that time spent using ICT devices was longer in the overall-low group than in the overall-high and overall-low groups and longer for the overall-medium group (significance level of 5%).

Table 3

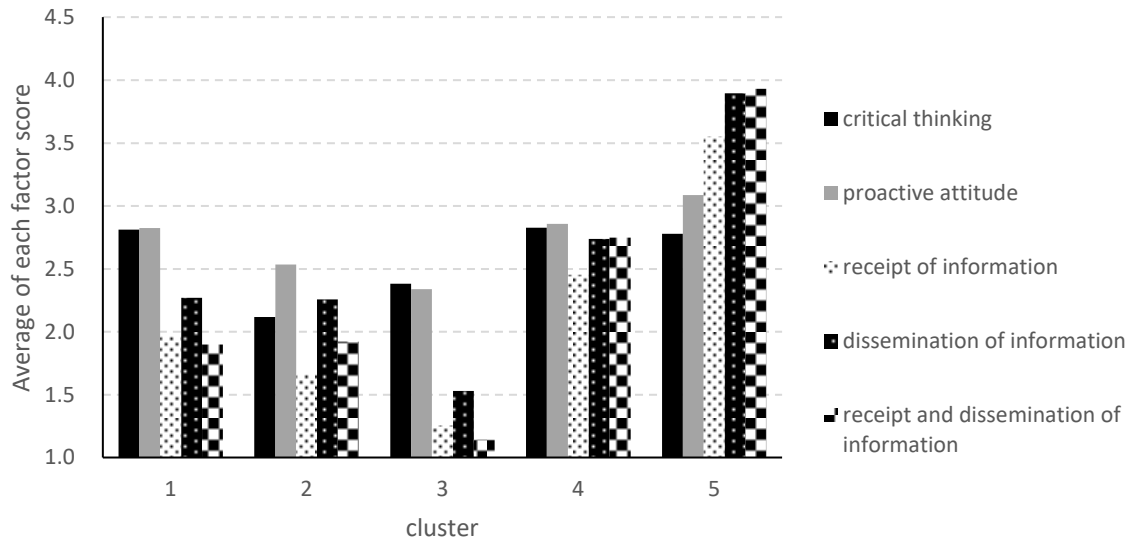
Results of multiple regression and logistic regression analysis

independent variable	multiple regression analysis		logistic regression analysis		
	TV β	smartphone β	OR	overall time 95% CI	
Media Literacy Scale					
Critical Thinking		0.05			
Proactive Attitude	-0.05		1.34	0.98, 1.87	
Media Manipulation Skills Scale					
Receipt of Information	0.05	-0.14 **	0.70	0.47, 1.02	
Dissemination of Information		0.13 **	1.80	1.22, 2.68 **	
Receipt and Dissemination of Information		0.10 **			
Strategies for Using ICT Devices with Children Scales					
Neglect		-0.21 ***	-	-	
Discussion	-0.08 **		-	-	
Guidance			-	-	
Positive-Negative Image Scale					
Positive Image			-	-	
Negative Image (concern about prolonged use)		0.11 **	-	-	
Negative Image (influence on behavior)	-0.04	**	-	-	
parents' media usage time					
respondents	0.36 ***	0.26 **	2.10	1.54, 2.90 ***	
spouses	0.22 ***	0.17 **	1.83	1.32, 2.57 ***	
respondents' sex					
male		0.14 *			
respondents' occupation					
homemaker					
respondents' age					
age					
respondents' income levels					
-400					
400-600	0.02				
600-800	0.11				
800-	-0.10				
unknown	0.12				
child's age					
3-6 years old	0.09	0.13 *	2.44	1.38, 4.44 **	
	R^2	0.299	0.243	Null deviance	594
	Adjusted R^2	0.292	0.235	Deviance	407
	p -value	<.001	<.001	AIC	421
	AIC	2,686	2,767		

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. OR = Odds Ratio, CI = Confidence Interval. Concerning "parents' media usage time," we matched the dependent variable device with the independent variable device. For example, in a multiple regression analysis in which children's TV viewing time was the dependent variable, respondents' and spouses' TV viewing time was the independent variable.

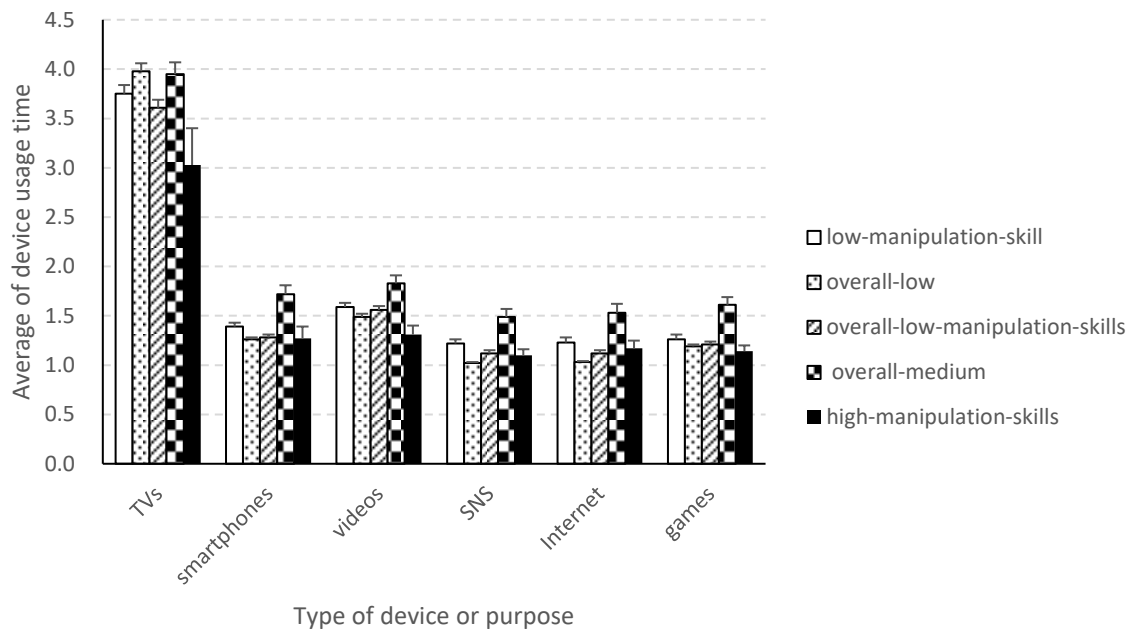
A similar analysis of variance was conducted for the time of smartphone use. The main effects of cluster ($F [4, 1111] = 15.193, p < .000$) and age ($F [1, 1111] = 4.853, p < .05$) were significant, but the interactions were not significant. Multiple comparisons showed that the use in the overall-medium group was significantly longer than in the other groups.

Figure 1
Means of each factor score in each cluster



Another analysis of variance was conducted for time spent using ICT devices by purpose (watching videos, using SNS, using Internet, and playing games). The main effects of cluster ($F [4, 1111] = 7.062, p < .000$) and age ($F [1, 1111] = 7.350, p < .01$) were significant for video viewing, but the interaction was not significant. Multiple comparisons showed that the overall-medium group spent significantly more time watching videos than the other groups.

Figure 2
Average time spent using ICT devices by cluster for each device or purpose



Note. TVs and smartphones indicate the device used, and videos, SNS, Internet, and games indicate the purpose of use. The legend indicates the name of the group. Error bars indicate *SE*.

For SNS use, the main effect of cluster ($F [4, 1111] = 17.180, p < .000$) was significant, but not for the main effect of age or interaction. Multiple comparisons showed that the overall-medium group spent significantly more time using SNS than the other groups, and the low-operating-skill group spent more time using SNS than the overall-low group.

For Internet use, the main effect of cluster was significant ($F [4, 1111] = 18.754, p < .000$), but not for the main effect of age or the interaction. Multiple comparisons showed that the overall-medium group spent significantly more time

using the Internet than the other groups, and the low-operating-skill group spent more time using the Internet than the overall-low group.

For game use, the main effects of cluster ($F [4, 1111] = 14.787, p < .000$) and age ($F [1, 1111] = 31.496, p < .000$) were significant, and the interaction was not significant. Multiple comparisons showed that the overall-middle group spent more time using games than the other groups.

To explore the influence of parental characteristics on the situation in which children use ICT devices long enough to negatively affect their development, we conducted a logistic regression analysis (stepwise method) using whether the cutoff point was 4 hours or more of their children's ICT device usage time (Table 3). The cutoff point was set at 4 hours because children who watch TV for more than 4 hours tend to have delayed language development (Tanimura et al., 2004); we considered less than 4 hours to be appropriate screen time for children. The independent variables selected were media literacy factor, media manipulation skill factor, media usage time of parents (respondents and spouses), gender of respondents, whether respondents were housewives or not, age of respondents, household income, and age of children. The results indicated that the better the dissemination of media-manipulation skills, the lower the probability of using media too long, the better the receipt, the higher the probability of using media too long, the longer the parent used media, and the higher the probability when the age of the child was between 3–6 years.

Discussion

The purpose of this study was to determine what parent characteristics are associated with children's appropriate or inappropriate use of ICT devices. Therefore, this study focused on "prolonged use," which is particularly easy to quantify and treat as appropriate or inappropriate and a powerful concern of parents.

Throughout the analysis, children aged 3–6 were more likely to use ICT devices than children aged 1–2. This is natural given children's cognitive and motor development, and the results are consistent with previous research (e.g., Benesse Educational Research and Development Institute, 2018).

Multiple regression analysis with time spent using ICT devices as the dependent variable indicated a relatively strong association between the time spent by parents and the time spent by children using ICT devices. This trend has also been reported in a study of children's and parents' TV-viewing time (Kano et al., 2009). This study showed that similar parent–child associations were found for digital devices such as smartphones. Since children's habits at home are constructed through their parents, it is important for parents to be in control of their own screen time to prevent inappropriate prolonged use by their children.

In addition, the fact that parents have concerns about prolonged use does not have as strong an effect on children's time spent using ICT devices. A positive association was found for the time spent watching TV and a negative association for time spent using smartphones, and the partial regression coefficients for both were low. This suggests that, although there is a strong shared concern among parents in general about prolonged use of ICT devices, this in itself does not necessarily lead to appropriate ICT device use, and it is possible that other factors are significantly related. Therefore, it is important to educate parents in general about concerns about prolonged use of ICT devices, but this alone may not be sufficient.

Also of interest is the effect of the groups created by the cluster analysis on the time spent using ICT devices. Analysis of variance revealed that the groups with high media manipulation skills consistently spend the shortest time using ICT devices, and this is especially true for TV-viewing time. Since TV viewing does not require any special skills and is an extremely passive act of contact with ICT devices, it tends to increase the length of time spent in contact with ICT devices. In addition, while this group has the skills to use ICT device tools that require more advanced knowledge than TV, these children do not spend as much time using ICT devices. These findings suggest that deep involvement with ICT devices and confidence building may, in fact, lead to control over the tools.

Conversely, the group that consistently spent more time using ICT devices was, surprisingly, the overall-medium group. This group is the most populous with some media literacy but only mediocre media-manipulation skills. Parents in this group have a rambling understanding of what they should do, but their media-manipulation skills are not that high, so they may be using ICT devices relatively passively to the extent that they can use them conveniently. Although they have knowledge of the ideal state, they may not be able to engage actively and confidently with ICT devices, which may lead to a gap between the ideal state and the actual use of ICT devices. As a reaction, this may lead them to give up and use ICT devices for long hours, which they do not want. Based on the above, to encourage children to use ICT devices appropriately, it may be necessary to provide support based not on superficial knowledge of media literacy but rather on a deeper and more active involvement of the parents themselves to improve their ICT device manipulation skills and lead them to a state where they feel they are proficient in using the media.

However, the results of the logistic regression analysis also indicate the opposite effect of dissemination and receipt media-manipulation skills on pathological prolonged use. This may be because receipt is easier than dissemination, and active receipt behavior reflects more frequent ICT device contact rather than greater skill. Goto & Ikuta (2004) compared the means of item scores on the receipt, dissemination, receipt and dissemination factors among elementary school students, junior high school students, and university students and adults. The results indicated that some items in the receipt and receipt and dissemination factors did not show significant mean differences between junior high school students and university students and adults, suggesting that the receipt and receipt and dissemination factors had more easy content than the dissemination factor. Among the manipulation skills, having more advanced skills may have controlled the children's time spent using digital media. From the above, it can be inferred that the more parents themselves acquire not only media literacy knowledge but also more advanced manipulation skills, the more effective it is for them to acquire the confidence to be familiar with and control ICT devices for their children's prolonged use.

Conclusion

This study examined parents' factors related to children's use of ICT devices within an appropriate range of screen time. The first factor influencing children's prolonged use of ICT devices is the parents' own screen time. Therefore, it is important for parents to review and control their own behavior before considering controlling their children's. It is also suggested that media literacy, which is superficial knowledge of "what to do," does not have a strong influence on children's time spent using ICT devices. Even if parents possess this knowledge, it may be difficult to intervene actively in ICT device use because the busy daily routine only makes them feel guilty for not having control.

The present study suggests that the control of children's ICT device use time is influenced by the parents' own state of familiarity with the ICT devices to the extent that they can actually operate them well. This foreshadows the possibility that a state in which parents can confidently face ICT devices may lead to adaptive use of ICT devices by children. When holding training sessions for parents on ICT device use by children, it may be necessary to provide opportunities that include hands-on experience so that parents can actually experience and gain confidence in their own behavior rather than merely imparting superficial knowledge. This may lead to a place where true media literacy can be built.

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