

Mediation Effect of Perception of Parenting Efficacy on Relationship between Smartphone Use Level and Parenting Behavior of Mothers of Infants and Children

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ABSTRACT

This study is descriptive research which aims to understand what kind of mediation effect the feeling of parenting effectiveness has in relation to mothers' smartphone use and parenting behavior. The subjects of this research were mothers raising infants and children in three regions across Korea, and data were collected using smart phones, where a total of 279 mothers were subjected to statistical analysis. SPSS 25.0 was used for statistical analysis, Chi-square, correlation analysis, and multiple media were derived using Process macro as research methods. To specifically evaluate the smartphone use of mothers with infants and children, they were classified into a "general smartphone use" group and an "overuse smartphone use" group. In the general smartphone use group, the relationship between smartphone use and parenting behavior was significant, and in the relationship between the general smartphone use group and parenting behavior, affective efficacy, [B=-.0055, (95% CI:-.0127~-0.0005)] and game efficacy[B=-.0083, (95% CI:-.0083~-0.0004)] were confirmed as mediating factors in the relationship between the general smartphone use group and parenting behavior. Smartphone overuse group was not associated with parenting behavior. In this study, parents with infants and children often use smartphones, and during the time they use their smartphones, they had less time to concentrate on their children, which restricted their active parenting behavior. Therefore, the results of this study can be used as base for various studies on mothers who take care of infants and children.

Keywords: smartphone, addiction, parenting, efficacy, behavior

1. INTRODUCTION

According to the smartphone dependency report in 2021 [1], smartphone overdependence risk group has shown a continuous increase in the trend of 20% in 2019, 23.3% in 2020, and 24.2% in 2021. In addition, post 4th industrial revolution, increase in the convenience, familiarity, and utilization of media use has resulted in excessive and repeated use, leading to media addictive behavior. Smartphone addiction increases its usage time with satisfaction in the virtual world while using smartphones. Such behaviors reduces empathy with others in everyday life and causes people to experience maladaptive behaviors and emotions including anxiety, depression, stress, impulsivity, and poor sleep quality [2].

Women in their 20s and 30s use smartphones repeatedly to communicate with others, so they are at a greater risk to be addicted to smartphones than other age groups. Thus, there is the need to pay close attention to smartphone addiction as it can have implications to the life cycle of marriageable age and childbearing age [3]. Not only impacting their personal lives, mothers with smartphone addiction tendencies are associated with negative parenting behaviors, such as hostile and intrusive interactions with their children [4]. Infants and children learn about society through their mothers and form stable attachment relationships for brain development and social adaptation through appropriate interactions with their caregivers [5]. However caregivers with addictive

behavior are not only unable to react sensitively to their children's behavior, the appearance of mothers who frequently use smartphones also increases their children's curiosity and positive perceptions of smart devices, which results in their to be at an increased risk of overusing of smartphones as well [6]. Therefore, research is needed to investigate the relationship between smartphone uses and parenting behavior of mothers raising infants and children.

Parenting efficacy refers to the ability to care for a child, the motivation to successfully manage parenting problems and difficulties, having the confidence in the parent's role, and the belief in oneself to overcome difficulties in the parenting process. In addition, the sense of effectiveness of parenting is also related to parenting behavior [7, 8]. Specifically, the parenting effect is the attitude of conveying emotions and support to the child with affective efficacy [9] and daily system organization effect, which means the general life style [10], a sense of discipline effect, which is the reaction to correct problem behavior [11], play efficacy, which reflects the inner state of the child [12], educational efficacy which is provided the child's needs for education [13]. Mothers with high parenting efficacy make efforts to acquire the knowledge and skills necessary for parenting behavior. In addition, such parents will be able to carry out parenting with positive trust and confidence in parenting behavior, regardless of their current negative circumstances from anxiety, stress, depression and atrophy [14][29]. On the contrary, mothers with low parenting efficacy are more likely to exhibit controlling and coercive parenting behaviors, potentially leading to abusing their children [7, 15]. Previous research has shown that smartphone overuse by mothers is related to cognitive aspects and behavioral relationships to parenting behavior, and is associated with lower parenting efficacy. However, previous studies have grasped the cognitive and behavioral aspects of maternal smartphone overuse on parenting, but mediation effect studies are lacking [16, 17,18].

The aim of the current study was to evaluate the relationship between mothers' smartphone use level and parenting behavior, investigating the mediating effects of the parenting efficacy subfactors, affection, daily system organization, discipline, play, and educational efficacy. For this purpose, the subjects of this study were classified into the general use group and the over use group according to the level of smartphone use. Furthermore, deviating from the result of estimating the effect of parenting, the subgroups of the effect of parenting behavior that were embodied were introduced at the same time, assessing whether it played an important intermediary role in the parenting behavior. Therefore, the results of this study are based on a variety of parenting behavior studies targeting mothers of infants and children who use smartphones. It can be a fundamental baseline material for providing positive and affirmative parenting behaviors to infants and children.

The specific research questions set for the purpose of this research are as follows.

1. Understand the difference between the general smartphone use group and the smartphone overuse group according to the general characteristics of the subjects
2. The correlation between the subject's smartphone usage level with parenting behavior, and parenting efficacy.
3. In relation to the subject's smartphone usage level and parenting behavior, investigate the mediation effect of parenting efficacy (affective efficacy, daily system organization efficacy, discipline efficacy, play efficacy, and education efficacy)

2. METHOD

2.1. Design

In this study, the mediation effects of parenting efficacy, affection efficacy, daily system organization efficacy, discipline efficacy, play efficacy, and education efficacy in relation to parenting behavior in each of the smartphone general use group and the smartphone overuse group were evaluated. This study is a narrative research study.

2.2. Subject of Research

The Google URL (Google) was used to search for mothers of infant and children who subscribed to an Internet site that shares parenting behavior information. Data was collected from August 1 to 29, 2018. Power analysis was conducted using the G*Power3.1 program to determine the sample size. In total, 275 was confirmed as an adequate sample size for regression analysis (effect size $f^2=.25$, significance level $\alpha=.05$, power $(1-\beta)=.95$). Considering the potential dropouts and dishonest questionnaire response, the questionnaire was distributed to 300 people having 279 participants included

in the final analysis.

2.3. Research variable

2.3.1. Genral Demorphics And Characteristics

The demographics of the subjects include age, educational attainment, income satisfaction, marriage period. the rest of the characteristics were indentified through their use of care facility, purpose of smartphone use, and smartphone usage duration. There were 7 questions in total.

2.3.2. Smartphone Use Level

For the smartphone use assessment, we used the smartphone addiction scale for adults (S-scale) [19] developed by the Korea National Information Society Agency (NIA, 2011). The questionnaire consisted of a total of 15 questions on the 5-point Likert scale, with the higher scores denoting increased risk of smartphone addiction. At the time of development, the classification categories were as follows: a total score of 44 or more were classified as a "high-risk user group", and those with a score between 40 and 43 classified as "potentially dangerous user group". In this study, the "high-risk use group" and the "potential risk group" were combined into an "overuse group" and 39 or less points were considered as the "general user group" [20]. At the time of tool development, Cronbach's α was .81, for this study it was .89.

2.3.3. Parenting Efficacy

Parenting efficacy in the present study used Meunier and Roskam's Echelle Globale du Sentiment de Compétence Parentale (EGSCP), a tool promulgated by Sung [21]. Parenting efficacy was composed of affective efficacy, daily system organization efficacy, discipline efficacy, play efficacy, and education efficacy, and there were 22 questions in total. On the 6-point Likert scale, a high score reflected greater parenting efficacy. In the Sung's [21] study, the Cronbach's alpha for each subscale were as follows; affective efficacy .75, daily organization efficacy .82, discipline efficacy .85, play efficacy .81, education efficacy .79 and .92 for the overall scale. In this study, Cronbach's alpha were as followers ; affective efficacy .82, daily organization efficacy .84, discipline efficacy .82, play efficacy .86, education efficacy .88, and .94 for the overall scale.

2.3.4. Parenting Behavior

To identify the parenting behaviors in this study utilized the Parent Behavior Inventory (IPBI) developed by Crase et al. (1978), flourished by Hong et al. (1995) and used by Shin et al [22]. There are 26 questions in total and the scores were rated on a 5-points Likert scale. A higher score indicated more positive parenting behavior. In the study of Shin [22] Cronbach's alpha was .87 and in the present study, it was .90.

2.4. Analysis

Data nalysis was done using the SPSS Ver 25.0 program. Mean and standard deviation was calculated for the level of smartphone use, parenting behavior, and parenting efficacy. The smartphone use level according to the subject's general characteristics was analyzed by χ^2 , and the correlation between the smartphone use level, parenting efficacy, and parenting behavior were analyzed using Pearson's correlation coefficient. A multiple regression analysis was performed to verify the mediation effect of the feeling of parenting efficacy, and the SPSS Process macro developed by Preacher & Hayes was used to verify the mediation effect. The method presented by Preacher & Hayers [23] is a method of verifying the parameter effect by inputting parameters at the same time using the Process macro, and the number of bootstrap iterations was set to 5000 times. The multimediator model was then analyzed using the 95% confidence interval method.

2.5. Research Ethical Considerations

This research received research approval (MC18QCSE0061) from the Research Council of Catholic University of Korea. Data was collection only from subjects who consented to research participate in the conduct of the study after information was provided including the purpose of the research and details regarding the protection of personal information. Participants were informed that they could withdraw from the study during their participation, and that their information would not be used for purposes other than research, and that they would not be penalized for withdrawal.

3. RESULTS

3.1. Differences between subject's general characteristics and smartphone useage level

According to the smartphone usage level, 65.9% (184 people) were general use group and 34.1% (95 people) in the overuse group. People in their 30s accounted for the most age that . In terms of educational background, 50.0% (92 people) of the general use group and 40.0% (38 people) of the over use group had university degree. Most participants were satisfied with their income, 76.6% (141) in the general use group and 81.1% (77) in the over use group. Marriage period was between one and three years, with 27.2% (50 people) of the general use group and 34.7% (33 people) of the over use group. For participants who used child care facilities, 62.5% (115) is in the general use group and 60% (57) in the over use group. Smartphone use time was five hours or less, with 83.7% (154 people) of the general use group and 80% (76 people) of the over use group. Finally, for the purpose of smartphone use, 45.1% (83 people) of the general use group mainly used searching, and 40% (38 people) of the over use group mainly used SNS (Table. 1).

Table 1. General characteristics (N=279)

Categories		Smartphone General use group (184)	Smartphone Overuse group (95)	χ^2 (p)
Age	20's	19(10.3)	20(21.1)	7.503 (.023)
	30's	151(82.1)	72(75.8)	
	40's	14(7.6)	3(3.2)	
Education	High school	16(8.7)	7(7.4)	4.074 (.254)
	College	47(25.5)	27(28.4)	
	University	92(50.0)	38(40.0)	
	≥Master's degree	29(15.8)	23(24.2)	
Income	Dissatisfaction	43(23.4)	18(18.9)	.142 (.986)
	Satisfaction	141(76.6)	77(81.1)	
Marriage period	<1year	46(25.0)	27(28.4)	3.412 (.332)
	1-2 year	50(27.2)	33(34.7)	
	3-4 year	47(25.5)	17(17.9)	
	≥5year over	41(22.3)	18(18.9)	
Use of care facility	No	69(37.5)	38(40.0)	1.66 (.684)
	Yes	115(62.5)	57(60.0)	
Purpose of smartphone use	SNS	59(32.1)	38(40.0)	4.176 (.383)
	play	7(3.8)	3(3.2)	
	Shopping	26(14.1)	18(18.9)	
	Search	83(45.1)	32(33.7)	
	Other	9(4.9)	4(4.2)	
Smartphone useage	≤5 hour	154(83.7)	76(80.0)	.657

time	≥6 hour	30(16.3)	19(20.0)	(.720)
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*p<.05, **p<.01, ***p<.001

3.2. Correlation between smartphone usage level, parenting efficacy, and parenting behavior

The correlation between mothers with parenting efficacy and parenting behavior is as follows. The level of smartphone use showed a negative correlation with parenting efficacy($r=-.343$), affective efficacy($r=-.187$), daily system organization efficacy($r=-.183$), discipline efficacy($r=-.319$), play efficacy($r=-.328$), education efficacy ($r=-.328$) and parenting behavior($r=-.276$). All correlation values were significant. In other words, when the level of smartphone use is high, affective efficacy, daily system organization efficacy, discipline efficacy, play efficacy, and parenting behavior is low (Table. 2).

Table 2. Correlation among variables

	Smartphone Over-use	Smartphone General use	1	2	3	4	5	6	7
Smartphone use1	43.62 ±3.54	33.76 ±4.68							
Parenting efficacy2	4.15 ±0.68	4.50 ±0.66	- .343**						
Affective efficacy3	4.43 ±0.72	4.65 ±0.71	- .187**	.795**					
Daily system Organization efficacy4	4.29 ±0.86	4.48 ±0.84	- .183**	.728**	.420**				
Discipline efficacy5	3.96 ±0.90	4.46 ±0.88	- .319**	.806**	.594**	.404**			
Play efficacy 6	3.92 ±0.91	4.46 ±0.88	- .328**	.775**	.630**	.407**	.528**		
Education efficacy7	4.16 ±0.94	4.55 ±0.92	- .328**	.863**	.578**	.653**	.643**	.515**	
Parenting behavior	3.86 ±0.39	4.00 ±0.43	- .276**	.611**	.567**	.406**	.434**	.522**	.511**

3.3. The relationship between smartphone use level, parenting efficacy, and parenting behavior in infants and children

3.3.1. Influence of smartphone general users on parenting behavior through perception of parenting efficacy

In relation to the level of smartphone use and parenting behavior, the multiple mediation effects of affection efficacy, daily system organization efficacy, discipline efficacy, play efficacy, and education efficacy were tested among those within the general smartphone use category.

In Step 1, the regression model for the influence of independent variables (smartphone use levels) on the mediator variables (five factors of parenting efficacy) demonstrated statistical significance ($p < .05$). Results demonstrated that affective efficacy ($B=-.0306$, $p < .01$), daily system organization efficacy ($B=-.0275$, $p < .05$), discipline efficacy ($B=-.0354$, $p < .05$), play efficacy ($B=-.0401$, $p < .01$), education efficacy ($B=-.0573$, $p < .001$) had positive significant effects.

For step 2, the direct effects of smartphone usage on parenting behavior was also significant ($F=16.236$, $p < .001$) and it was found that increased smartphone use had a significant negative effect on parenting behaviors ($B=-.0261$, $p < .001$).

For steps 2 and 3, affective efficacy and play efficacy had a common and significant effect on parenting behavior. Overall, mothers in the general smartphone user group reported smartphone use had partial mediation effect on parenting behavior through affection efficacy and play efficacy only (Table 3).

Table 3. Mediation effect of parenting effective in relationship between smartphone general use group and parenting behavior among mothers

	Effect	SE	t	p	F(R2)
(1 step) Smartphone use level → Parenting efficacy					
Effective efficacy	-.0306	.0111	-2.7583	.0064	7.6080*** (.0401)
Daily system Organization efficacy	-.0275	.0132	-2.0821	.0387	4.3349* (.0233)
Discipline efficacy	-.0354	.0138	-2.5710	.0109	6.6098* (.0350)
Play efficacy	-.0401	.0130	-3.0861	.0023	9.5238*** (.0497)
Education efficacy	-.0573	.0139	-4.1234	.0001	17.0027*** (.0854)
(2 step) Smartphone use level → Parenting behavior	-.0261	.0065	-4.0294	.0001	16.236*** (.0819)
(3 step) Independent+Mediation→Parenting behavior					16.4213*** (.3576)
Smartphone use level	-.0127	.0058	-2.1888	.0299	
Affective efficacy	.1785	.0502	3.5582	.0005	
Daily system Organization efficacy	.0026	.0406	0.0641	.9489	
Discipline efficacy	.0093	.0398	0.2343	.8150	
Play efficacy	.0903	.0397	2.2723	.0243	
Education efficacy	.0690	.0449	1.5366	.1262	

Next, the mediation effect of parenting efficacy was verified using the bootstrap test. There was no 0 between the upper and lower limits in the 95% confidence interval of the pathway that mediates affective efficacy and play efficacy on parenting behavior, indicating that the mediation effect is significant. In other words, affective efficacy and play efficacy were intermediary factors in the relationship between smartphone usage and parenting behavior among mothers with infants and children (Table 4).

Table 4. Mediation effect of parenting effect in relationship between smartphone general use group and parenting behavior

	B	SE	LLCI	ULCI
Smartphone use → Affective efficacy → Parenting behavior	-.0055	.0033	-.0127	-.0005

Smartphone use→Daily system Organization efficacy → Parenting Behavior	-.0001	.0011	-.0024	.0023
Smartphone use→Discipline efficacy→ Parenting behavior	-.0003	.0019	-.0044	.0033
Smartphone use→Play efficacy→ Parenting behavior	-.0036	.0020	-.0083	-.0004
Smartphone use→Education efficacy→ Parenting behavior	-.0040	.0030	-.0100	.0017

3.3.2. Influence of smartphone overuse mothers on parenting behavior through perception of Parenting efficacy

Mothers in the overuse group were assessed. For Step 1, the regression model for the influence of smartphone usage levels on mediators were evaluated (five factors of parenting efficacy). For 2 Step, the direct effects of smartphone usage levels on the parenting behavior were calculated. Finally, in step 3, the association of smartphone use on parenting behavior mediated through parenting efficacy were conducted. Results of Step 1 demonstrated significant association with discipline efficacy ($p=.0277$), play efficacy ($p=.0113$), and educational efficacy ($p=.0392$). However for Step 2, smartphone overuse and parenting behavior did not demonstrate a significant effect. Thus, the results show that mothers in the smartphone overuse group had no significant effect on parenting efficacy (Table 5).

Table 5. Mediating effect of parenting efficacy in relationship between smartphone overuse group and parenting behavior among mothers

	Effect	SE	t	p	F(R2)
(1 step) Smartphone use level → Parenting efficacy					
Effective efficacy	.0160	.0211	.7614	.4483	0.5797 (.0062)
Daily system Organization efficacy	-.0424	.0247	-1.7176	.0892	2.9503 (.0307)
Discipline efficacy	-.0577	.0258	-2.2361	.0277*	4.999* (.0510)
Play efficacy	-.0665	.0257	-2.5851	.0113*	6.6827* (.0670)
Education efficacy	-.0561	.0268	-2.0919	.0392*	4.3760* (.0449)
(2 step) Smartphone use level → Parenting behavior	-.0100	.0114	-.8813	.3804	0.7767 (.0083)
(3 step) Independent+Mediation→Parenting behavior					
Smartphone use level	.0019	.0095	.2038	.8390	16.2990*** (.5264)
Affective efficacy	.1594	.0682	2.3361	.0218	
Daily system Organization efficacy	.1260	.0459	2.7450	.0073	
Discipline efficacy	-.0203	.0465	-.4375	.6628	
Play efficacy	.1175	.0488	2.4063	.0182	

Education efficacy	.0455	.0509	.8931	.3743	
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In a bootstrap test of the indirect effect of smartphone overuse, the indirect effect on parenting behavior was not significant, including zero between the upper and lower limits of the 95% confidence interval. There was no significant mediating effect for mother's smartphone usage on parenting behavior through parenting efficacy (Table 6).

Table 6. Mediation effect of parenting efficacy in relationship between smartphone overuse group and parenting behavior

	B	SE	LLCI	ULCI
Smartphone use → Affective efficacy → Parenting behavior	.0026	.0047	-.0061	.0135
Smartphone use → Daily system Organization efficacy → Parenting Behavior	-.0053	.0041	-.0126	.0040
Smartphone use → Discipline efficacy → Parenting behavior	.0012	.0030	-.0044	.0081
Smartphone use → Play efficacy → Parenting behavior	-.0078	.0053	-.1960	.0006
Smartphone use → Education efficacy → Parenting behavior	-.0025	.0037	-.0116	.0028

4. DISCUSSION

This study aims to understand the mediation effect of the effectiveness of parenting in relation to the relationship between smartphone usage level and parenting behavior among mothers with infants and children. Among mothers in the smartphone general users category, the results confirmed the relationship between the smartphone usage and parenting behavior, with affective efficacy and play efficacy being significant mediators. However, no intermediary factors were found in relation to parenting behavior in the smartphone overuse group.

There was a mediation of affection efficacy in relation to parenting behavior of the smartphone general user group. These results supported Hur's [18] findings that smartphone use was inversely associated with affective efficacy. Mothers share greater behavioral expressions than verbal expressions with their infant or child, and because they grow quickly, mothers may lack in distinguishing between normal and abnormal in the development process [18]. In addition, during the process of raising an infant or a child, mothers experience reduction in external activities, finding it difficult to form broader relationships with family, friends, and children [24]. As a result, mothers may search and compare their child's development with other age children through smartphones, where information can be easily acquired. Since information on the Internet can be continuously accessed, unnecessary and excessive information may increase anxiety about their child's development, decreasing confidence in child rearing, and actively reducing parenting behavior [18]. Therefore, guidance searching for necessary information and diversification of knowledge acquisition regarding parental behavior needs to be established.

For mothers in the general smartphone user group, play efficacy also mediated the relationship between parenting behaviors. These results supported Cha et al [25] finding that smartphone use and play advocacy are negatively correlated. Infants and children express their emotions through play henceforth, mothers tend to directly participate in their children's attachment, interaction, and play. Providing toys and the right environment has various effects on a child's development, including leadership, emotional, and social development [26, 27]. Mothers of infants and children can feel that they lack knowledge about how to approach play with their child, what kind of play to choose, and what child-centered play looks like. Consequently, mothers may opt to use smartphone to obtain such information. However, during such time spent on the smartphones will limit close interaction with the infant and child restricting positive parenting behaviors [28].

In this study, the level of smartphone useage among mothers raising infants and children was found to be a mediator

of the feeling of parenting efficacy in relation to their parenting behavior. We categorized the smartphone use of mothers with infant and child into a general use group and an overuse group. Only the smartphone general use group showed a mediation effect in affective efficacy and play efficacy among parenting efficacy. Using a smartphone can be a meaningful and convenient in finding information about parenting, but excessive use in the parenting process reduces the time to focus on the child, making it difficult to react passively or sensitively to parenting behavior. Therefore, it will be necessary to diversify the methods of acquiring parenting information that mothers with infants and children need to use so that they can provide positive and positive parenting behaviors to their children.

5. CONCLUSION

In this study, mothers were divided into a smartphone over use group and a general use group, and the mediation effect of the feeling of parenting effect was confirmed in relation to parenting behavior. Only the general use group of mothers showed a negative relationship with parenting behavior, confirming parenting efficacy as a mediating factor. Therefore, since the use of smartphones by mothers has negative parenting behavior, administrative and psychological support should be provided to diversify information acquisition methods during the parenting process. Contrary to research findings that smartphone overuse is associated with parenting behavior, the use of self-reported questionnaires limits the ability to measure the actual impact on smartphone addiction [17]. We propose a mother's smartphone addiction study using various methods such as repeated studies with additional subjects and phenomenological research methods.

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