

How Mothers' Problematic Smartphone Use Affects Adolescents' Problematic Smartphone Use: Mediating Roles of Time Mothers Spend with Adolescents and Adolescents' Self-Esteem

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Purpose: This study aimed to investigate the serial mediating effects of the time mothers spend with their adolescent children and the adolescents' self-esteem on the relationship between mothers' and adolescents' problematic smartphone use.

Patients and Methods: This study was a secondary analysis of data extracted from the Korean Children and Youth Panel Survey (KCYPs) in 2018, which comprised data on first-year middle school students. Mediation analysis was conducted using Model 6 of the Hayes' PROCESS macro for SPSS.

Results: The mediating effect of the time mothers spent with adolescents on the relationship between mothers' and adolescents' problematic smartphone use was significant, but the mediating effect of adolescents' self-esteem was not significant. Mothers' problematic smartphone use was found to significantly affect adolescents' problematic smartphone use by sequentially mediating the time mothers spent with adolescent children and adolescents' self-esteem.

Conclusion: It was concluded that, to lower adolescents' problematic smartphone use due to mothers' problematic smartphone use, appropriate interventions should be formulated to help adolescents develop higher self-esteem through sufficient mother-child interaction time.

Keywords: problematic smartphone use, mother-child relationship, adolescents self-esteem, mediation analysis

Introduction

Problematic smartphone use, which denotes psychological or behavioral dependence on smartphones, is a debilitating behavioral problem that is prevalent worldwide.^{1,2} Although it is a term used in the same context as smartphone overuse, dependence, and addiction, it is a more-evolved concept and a non-pathological term recognizing the need for preventive action.³ Compared with adults, the younger population, including adolescents, is more vulnerable to smartphone overuse and related problems because they lack the ability to control and suppress their impulses.⁴ Moreover, adolescence is a period of high interest in and active acceptance of new media, which is likely to create an intemperate dependence of the youth on smartphones.⁵ A recent meta-analysis found that the prevalence of problematic smartphone use among children and young people ranges between 10% and 30%, indicating a widespread problem.⁶ Problematic smartphone use also has a high prevalence among Korean adolescents. According to the 2021 Statistics on the Youth report in Korea, about 37.0% of adolescents belonged to the risk group of over-dependence on smartphones, with middle-school students being the most vulnerable group among all school-age population groups.⁷ Problematic smartphone use among adolescents may lead to severe levels of psychological disturbances and maladaptive conditions such as anxiety, depression,

somatic symptoms, impulsiveness, attention deficiency, sleep problems, poor life satisfaction, and poor academic achievement.^{5–9} Furthermore, excessive smartphone use can be considered a major social problem as it exhibits certain characteristics of addiction such as severe withdrawal symptoms, difficulties performing daily activities, and lifelong psychiatric disorders.¹⁰ Against this background, it is crucial to identify the risk factors affecting problematic smartphone use among adolescents and plan a preemptive prevention strategy.

Recent studies have suggested that parents play a powerful role in shaping children's problematic behaviors.^{11–13} According to a recent empirical study, as the COVID-19 pandemic has increased overall smartphone use, parental smartphone overuse is likely to exacerbate adolescents' smartphone overuse, which produces detrimental consequences on one's overall well-being and functioning.¹⁴ Low-quality interaction and poor bonding between parents and children have been reported as significant predictors of Internet overuse among adolescents.¹¹ Mun and Choi¹² reported that parental smartphone addiction is significantly associated with smartphone addiction in their children. Furthermore, mothers' smartphone overuse patterns may delay sensitive responses to stimuli from children, or worse, may lead to non-response.¹³ A previous study pointed out that the lack of time mothers spend with adolescent children negatively affects parental conversations and satisfaction with mother-and-child relationships.^{15,16} If mothers have a smartphone addiction, their children are less likely to perceive warmth and affectionate care from them, which is critical to forming a secure attachment and achieving positive psychosocial development.¹⁶ Accordingly, children whose needs are not met may experience a sense of neglect or abandonment, while trying to compensate for their longing for warmth and support in relationships by using external means,¹¹ which eventually develops into addictive behavior.¹⁷ As reinforcement of online social support plays a significant mediating role in the relationship between stress and smartphone addiction,¹⁸ it can be assumed that mothers' problematic smartphone use may also negatively affect their adolescent children's smartphone use. Furthermore, given the evidence that mothers addicted to smartphones are more likely to spend less time with their children and maintain less parent-child interaction,¹⁶ the time mothers and adolescents spend together seems to have a potent meaning in the relationship between mothers' and adolescents' smartphone dependence. With more parental support and sufficient quality time spent with family members, adolescents may engage in less addictive behaviors.

Self-esteem refers to one's sense of belief that he or she is valuable and worthy of respect.¹⁹ Several studies have reported that adolescents' self-esteem is one of the main variables affecting their smartphone dependence.^{12,19} Adolescents with low self-esteem are more likely to seek reassurance in the virtual world where they can easily experience intimacy and confidence.^{20,21} According to a previous study, there is a negative correlation between self-esteem and smartphone dependence (the higher adolescents' self-esteem, the lower their smartphone dependence).¹² Adolescents at high risk of smartphone dependence showed lower self-esteem and poorer quality of verbal interaction with parents.¹¹ Furthermore, mothers' positive parenting attitudes have been reported to significantly affect adolescents' self-esteem.²² In other words, self-esteem can be considered psychological capital that can prevent deviant behaviors among adolescents. Therefore, it is necessary to shed more light on self-esteem, which may be considered an effective strategy to prevent and reduce the negative impact of adolescents' problematic smartphone use.

Based on the above, it is crucial to highlight complex psychosocial and behavioral elements that influence adolescents' problematic smartphone use. However, only a few studies have explored the comprehensive factors affecting adolescents' problematic smartphone use, especially the mediating mechanisms that link mothers' problematic smartphone use to that of adolescents in the context of mother-child relationships and children's psychological capital. Therefore, this study aimed to investigate the serial mediating effects of the time mothers spend with adolescent children and adolescents' self-esteem on the relationship between mothers' and adolescents' problematic smartphone use.

Materials and Methods

Data Source and Study Sample

Data for this study were obtained from the nationally representative Korean Children and Youth Panel Survey 2018 (KCYPS 2018) conducted by the Korea Youth Policy Institute. The KCYPS was initiated to comprehensively understand the changes in the growth and development of children and youth in Korea. To guarantee a representative sample, a stratified multi-stage cluster sampling method was adopted in the KCYPS 2018. A total of 2590 first-year middle school students and their

guardians participated in the first survey in 2018. As middle school students are reported to be the most vulnerable to the risk of smartphone dependence in Korea,⁷ first-year middle school students who are spending their first year after transitioning from elementary school to middle school were selected as the participants for this study; in total, 2278 participants whose mothers responded to the survey were selected. Moreover, as smartphone dependence among adolescents and their mothers was the main variable, they were included in the sample only if both adolescents and their mothers responded that they had their own smartphones. The final sample included 2170 adolescents and their mothers.

Measures

Problematic Smartphone Use by Adolescents and Their Mothers

Problematic use of smartphones by adolescents and their mothers was measured using the Smartphone Addiction Proneness Scale developed by Kim et al²³. The scale includes four subdomains: (1) disturbance of adaptive functions, (2) virtual life orientation, (3) withdrawal, and (4) tolerance. It comprises 15 items, and each item is measured using a 4-point Likert scale (1 = not at all, 4 = extremely). The positive items are scored in reverse; higher scores indicate higher levels of problematic smartphone use. In the present study, Cronbach's alpha was 0.876 (adolescents) and 0.864 (mothers).

Time Mothers Spent with Adolescent Children

The time mothers spent with adolescent children was measured using mothers' responses to questions about how much time they spent each day with adolescents participating in the survey. This included mealtimes, study, leisure activities, and conversation time, excluding sleep duration. Mothers were instructed to respond to the average amount of time spent with their adolescent children on weekdays and weekends separately. In this study, the time mothers spent with adolescent children on weekdays and weekends was combined and used. A higher total score meant more time spent with adolescent children.

Adolescents' Self-Esteem

Adolescents' self-esteem was measured using the self-esteem scale developed by Rosenberg²⁴ and translated by the National Youth Policy Institute. The scale comprises 10 items, and each item is measured using a 4-point Likert scale (1 = not at all, 4 = extremely). Negative items are scored in reverse, with higher scores indicating higher levels of self-esteem. In the present study, Cronbach's alpha was 0.862.

Covariates

In this study, we controlled for gender, parenting style, and depressive symptoms, which could affect adolescents' problematic smartphone use, based on previous studies.^{12,25} Perceived parenting style was measured using the Korean Version of the Parents as Social Context Questionnaire for Adolescents (K-PSCQ) by Kim and Lee.²⁶ The scale comprises 24 items, with each item measured using a 4-point Likert scale (1 = not at all, 4 = extremely). The negative items are scored in reverse, and higher scores indicate that adolescents perceive parenting styles positively. In the present study, Cronbach's alpha was 0.919. Depressive symptoms were measured using the Korean version of the Symptom Checklist (KSCL-90).²⁷ The scale comprises 10 items, and each item is measured using a 4-point Likert scale (1 = not at all, 4 = extremely). Higher scores indicate more depressive symptoms. In the present study, Cronbach's alpha was 0.921.

Data Analysis

Data analysis was conducted using IBM SPSS Statistics 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistical analyses were performed to describe sample characteristics. Pearson's correlation analysis was conducted to identify the relationships among the four main variables (ie, mothers' problematic smartphone use, time mothers spend with adolescent children, adolescents' self-esteem, and adolescents' problematic smartphone use). We adopted Model 6 of the PROCESS macro for SPSS provided by Hayes²⁸ to evaluate the mediating role of time mothers spend with adolescent children and adolescents' self-esteem in the effect of mothers' problematic smartphone use on adolescents' problematic smartphone use. The 95% bootstrap confidence intervals from 5000 bootstrap replicates were used to evaluate the mediation effects. If the confidence intervals did not contain zero, the indirect effect was considered to be significant.

Table 1 Descriptive Statistics and Correlations Among the Main Variables

Variables	1	2	3	4
	r (p)	r (p)	r (p)	r (p)
1. Mothers' problematic smartphone use	1			
2. Time mothers spend with adolescent children	- 0.10***	1		
3. Adolescents' self-esteem	- 0.13***	0.12***	1	
4. Adolescents' problematic smartphone use	0.17***	- 0.12***	- 0.37***	1
Mean (SD)	1.77 (0.44)	12.4 (5.99)	3.00 (0.49)	2.03 (0.48)
Range	1- 4	0-38	1-4	1-4

Note: ***p <0.001.

Ethical Considerations

Prior to data collection, written informed consent was obtained from each student and their parent or primary guardian. The data in the KCYPS was collected while ensuring the anonymity and privacy of participants in accordance with the Declaration of Helsinki. Prior to the implementation of this study, approval for ethical exemption was obtained from the Public Institutional Review Board Designated by the Ministry of Health and Welfare (P01-202211-01-027). In compliance with the requirements of the institutions to which the authors of this study belonged, the researchers of this study asked for deliberation by the Public Institutional Review Board Designated by the Ministry of Health and Welfare.

Results

Descriptive Statistics and Correlations for Main Variables

Of the 2170 participants, 1168 were male (53.8%) and 1002 were female (46.2%). Table 1 shows the descriptive statistics and correlation matrix of the main variables. Mothers' problematic smartphone use was found to be positively correlated with adolescents' problematic smartphone use ($r = 0.17, p < 0.001$) and negatively correlated with the time mothers spent with adolescent children ($r = -0.10, p < 0.001$) and adolescents' self-esteem ($r = -0.13, p < 0.001$). Furthermore, time spent with adolescent children was positively correlated with adolescents' self-esteem ($r = 0.12, p < 0.001$) and negatively correlated with adolescents' problematic smartphone use ($r = -0.12, p < 0.001$). Adolescents' self-esteem was also negatively correlated with their problematic smartphone use ($r = -0.37, p < 0.001$).

Mediation Analyses

Figure 1 and Table 2 present the results of the serial mediation analyses. After controlling for the covariates (ie, gender, parenting style, and depressive symptoms), mothers' problematic smartphone use had a direct effect on adolescents' problematic smartphone use ($B = 0.118, p < 0.001$). Mothers' problematic smartphone use was negatively associated with

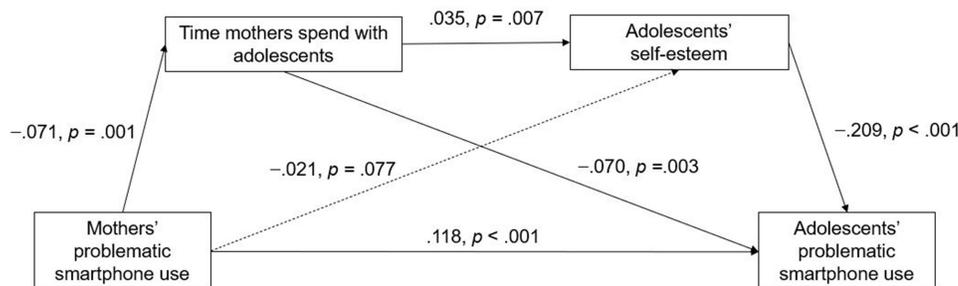


Figure 1 Serial mediation model of time mothers spent with adolescents and adolescents' self-esteem in the relationship between mothers' problematic smartphone use and adolescents' problematic smartphone use.

Notes: Path values are path coefficients; all coefficients are unstandardized; the model was adjusted by covariates (ie, gender, parenting style, depressive symptoms), and significant pathways are indicated by solid black arrows.

Table 2 Indirect Effect of Mothers' Problematic Smartphone Use on Adolescents' Problematic Smartphone Use

Pathway	Effect	Boot SE	Bootstrap 95% CI	
			Lower	Upper
Total indirect effects of MPSU on APSU	0.0098	0.0036	0.0032	0.0175
MPSU → time mothers spend with adolescent children → APSU	0.0049	0.0023	0.0011	0.0103
MPSU → adolescents' self-esteem → APSU	0.0043	0.0026	-0.0004	0.0099
MPSU → time mothers spend with adolescent children → adolescents' self-esteem → APSU	0.0005	0.0003	0.0001	0.0012

Note: 5000 bootstrap samples; indirect effects are unstandardized.

Abbreviations: MPSU, mothers' problematic smartphone use; APSU, adolescents' problematic smartphone use; SE, standard error; CI, confidence interval.

the time mothers spent with adolescent children ($B = -0.071$, $p = 0.001$). However, mothers' problematic smartphone use was not a significant predictor of adolescent self-esteem ($B = -0.021$, $p = 0.077$). The results also showed that the direct effect of the time mothers spent with adolescent children on self-esteem was significant ($B = 0.035$, $p = 0.007$). The effects of time mothers spent with adolescent children ($B = -0.070$, $p = 0.003$) and adolescents' self-esteem ($B = -0.209$, $p < 0.001$) on adolescents' problematic smartphone use were also found to be significant. The association between mothers' problematic smartphone use and adolescents' problematic smartphone use was found to be mediated by the time mothers spent with adolescent children ($B = 0.0049$, 95% CI = [0.0011, 0.0103]) but not by adolescents' self-esteem ($B = 0.0043$, 95% CI = [-0.0004, 0.0099]). Furthermore, the serial mediating effect of time mothers spent with adolescent children and adolescents' self-esteem in the association between mothers' and adolescents' problematic smartphone use was found to be significant ($B = 0.0005$, 95% CI = [0.0001, 0.0012]).

Discussion

The current study aimed to investigate the serial mediating effects of the time mothers spend with adolescent children and adolescents' self-esteem on the relationship between mothers' and adolescents' problematic smartphone use. The findings showed that mothers' problematic smartphone use had a significant impact on adolescents' problematic smartphone use, indicating that it is a profound risk factor for adolescents' problematic smartphone use. This is in line with a previous finding that revealed that excessive and uncontrolled use of media among parents affects adolescent media use.^{29,30} This result can be explained based on the social learning theory,³¹ which states that children learn behavior from influential and important persons in their lives, such as parents, peers, and teachers. Specifically, parents play a powerful and fundamental role in shaping adolescents' behaviors. The way parents use smartphones in a dysfunctional manner makes adolescents observe and imitate the behaviors of parents—authority figures with whom adolescents spend the longest time. Accordingly, adolescents who were constantly exposed to an environment in which their mothers were too preoccupied with their smartphones easily adopted an unhealthy use pattern, as they believed “It is normal and [causes] no harm.”¹⁶ Our study extends the findings of previous work by showing that behavioral addiction enhances the possibility of intergenerational transmission as a result of cumulative exposure to unhealthy parental behaviors.³² Hence, every effort should be made to ensure the provision of education to reduce maternal addictive behaviors when developing a psychosocial intervention program to reduce adolescents' problematic smartphone use.

In this study, mothers spending time with adolescent children were hypothesized to be a mediator between mothers' problematic smartphone use and adolescents' problematic smartphone use. The mediating effect analysis indicated that mothers' problematic smartphone use was associated with adolescents' problematic smartphone use by reducing the time mothers spent with their adolescent children. This is in conformity with the existing literature, which states that lack of parental care or parental indifference is associated with adolescents' negative affect, such as depression, which in turn drives adolescents to escape their negative emotions.¹⁶ In fact, smartphones can act as tools for an avoidant coping strategy, especially for the youth who experience negative emotions and distress;³³ moreover, if there is an obvious decrease in parental care or support, addictive behaviors may occur, as media activities are primarily used for managing negative affect.³⁴ Concordantly, adolescents who experience insufficient attention and care may suffer from psychological distress, which in turn may lead to psychopathological behavioral addictions. This finding can also be explained

with reference to the general purpose of smartphone use among the youth, for whom media is a common way to build close relationships with peers, and obtain a sense of social connection and belonging.³⁵ It is possible that adolescents who experience a lack of maternal interaction have a strong desire for close relationships, which makes them try to compensate for their unmet needs (eg, desire for warm relationships) by overusing smartphones.

We found that adolescents' self-esteem did not mediate the relationship between mothers' and adolescents' problematic smartphone use. This suggests a limit to the explanation of the effect of mothers' problematic smartphone use on adolescents' problematic smartphone use as a single factor in adolescent self-esteem. In other words, for a clear understanding of the mechanism of adolescents' problematic smartphone use, the influence of other factors surrounding self-esteem should be examined. An interesting and noteworthy finding of this study is that mothers' problematic smartphone use was found to significantly affect adolescents' problematic smartphone use by sequentially mediating the time mothers spend with adolescent children and the adolescents' self-esteem. In other words, mothers' smartphone dependence may lead to fewer mother-child interactions, aggravate the child's self-esteem issues, and subsequently lead to increased smartphone dependence in adolescents. Additionally, adolescents at high risk of smartphone dependence showed lower levels of self-esteem and poorer quality of verbal interaction with their parents.¹¹ A recent literature review pointed out that parents who were too absorbed with their smartphones were less responsive to their children, and this pattern eventually led to poor interaction, rarity of both verbal and nonverbal communication, and severe conflicts between parents and children.¹⁵ The results of our study were in line with the above findings, suggesting that the time mothers spend with adolescent children and adolescents' self-esteem play a significant mediating role in decreasing deviant behaviors in adolescents. Reducing smartphone usage among mothers, spending more time with their children, and securing children's self-esteem may prevent the transmission of problematic smartphone use between generations. Thus, our findings suggest a more comprehensive process of how mothers' problematic smartphone use affects adolescents' problematic smartphone use.

This study had some limitations. First, as the data used in this study were cross-sectional, there were limitations in describing a clear causal relationship between mothers' and adolescents' problematic smartphone use. Second, the data used in this study were collected retrospectively from self-report questionnaires, which may have generated recall bias or social desirability bias. In other words, it is possible to explain that mothers and adolescents recalled their own patterns of using smartphones differently from their actual responses, based on moral responsibility. Finally, as a limitation of the data, while the absolute amount of time parents and their adolescent children spent together was measured, the quality of time spent together was not assessed. This implies that it is desirable to measure not only the quantity but also the quality of time spent together as a measure of parent-child interaction to increase the reliability of results in future research.

Despite the abovementioned limitations, our findings were based on nationally representative data and can add to a comprehensive understanding of the mechanisms underlying the effects of mothers' problematic smartphone use on adolescents' problematic smartphone use.

Conclusion

This study's findings regarding a serial mediation role of the time mothers spend with adolescent children and adolescents' self-esteem on the relationship between mothers' and adolescents' problematic smartphone use provide indications for an important intervention strategy for adolescents' problematic smartphone use caused by parental addiction. In particular, as adolescence is a time when unhealthy behaviors like smartphone dependence can become permanent, thus making individuals prone to engage in chronic problematic behaviors, it is necessary to present practical approaches that simultaneously reduce mothers' smartphone use time and increase their interaction time with their children and enhance self-esteem establishment strategies. Such attempts can be efficient for multifaceted strategies to develop interventions for adolescents' problematic smartphone use.

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Disclosure

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