https://doi.org/10.33472/AFJBS.6.9.2024.3841-3856

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Related Variables Affecting Korean Elementary School Students' Smartphone Overdependence

Eunsil Kim[1], Hyundong Son[2], Seongmi Shin[3] & Ik-hyun Jun[4]

[1]Professor, Department of Child Welfare, Namseoul University, Republic of Korea

[2]Professor, Department of Education, Gwangju National University of Education, Republic of Korea

[3]Doctoral Degree Course Student, Department of Human Care, Namseoul University, Republic of Korea

[4]Member of Provincial Council, Chungcheongnam-do Provincial Council, Republic of Korea

Correspondence: Hyundong Son

Volume 6, Issue 9, 2024

Received: 09 March 2024

Accepted: 10 April 2024

Published: 20 May 2024

doi:10.33472/AFJBS.6.9.2024.3841-3856

Abstract

This study investigates smartphone overdependence among South Korean elementary school students and explores its prevalence and influencing factors. Participants in the study were 4th, 5th, and 6th graders of elementary schools living in Chungcheongnam-do province in Korea; 231 students agreed to participate in the study. Data were collected through face-to-face completion or via Google Forms questionnaires consisting of self-reports on gender, grade, family living together, location, time spent on a smartphone per day, days of smartphone use, age at first smartphone use, participation in smartphone prevention education, integrated smartphone overdependence, emotion regulation, peer relations, and school satisfaction. For data analysis, multiple regression analysis was conducted to determine the relationship between the variables that affect smartphone overdependence. Smartphone overdependence was used as the dependent variable, and average smartphone usage time, smartphone use frequency, age at onset of smartphone use, peer relationships, school life satisfaction, and emotional regulation were used as independent variables. First, the overdependence rate of 24.7% was lower than that of adolescents, emphasizing the need for early intervention due to children's critical developmental stages. Second, average usage time, smartphone use frequency, and emotional control were found to be significant variables affecting smartphone overdependence; however, age at smartphone use onset, peer relationships, and school life satisfaction were not. This study highlights the need for various prevention strategies that target emotional regulation and social skills. Limitations include the study's regional focus and self-reported data, necessitating broader regional representation and diversified sampling methods in future research.

Keywords: Smartphone Overdependence, Emotion Regulation, Peer Relationship, School Life Satisfaction, Multiple Regression Analysis

1. Introduction

With the rapid growth of the IT industry in Korea, smartphone use among children is increasing. According to the 2022 Broadcast Media Usage Behavior Survey, the overall smartphone ownership rate was 93.4%, which is similar to the last three years, and the smartphone ownership rate of teenagers was 99.4%, which is not much different from those in their 20s and 40s (99.8% in their 20s, 100.0% in their 30s, and 99.6% in their 40s), indicating that smartphones are recognized as an indispensable medium in daily life [1]. This is likely due to the high frequency of smartphone exposure at a young age compared to other age groups. Early and frequent exposure to smartphones has led to the serious problem of smartphone overdependence. According to a 2022 Smartphone Overdependence Survey, the risk of smartphone overdependence among adolescents aged 10–19 years is 30.2% (26.4% potential risk, 3.8% high-risk) in 2019, 35.8% (30.8% potential risk, 5.0% high-risk) in 2020, and 37.0% (31.3% potential risk, 5.7% high-risk) in 2021. In 2021, the risk of smartphone overdependence by grade level was 31.6% for elementary school students (26.6% potential risk, 5.0% high-risk), 41.0% for middle school students (34.5% potential risk, 6.5% high-risk), and 36.4% for high school students (30.7% potential risk, 5.7% high-risk). While elementary school students had a lower rate than middle and high school students, the rate of increase was 10 percentage points higher than the rate of increase for middle and high school students compared to 2020 (21.6% risk), indicating that the rate of increase is growing rapidly [2].

The closer these smartphones are to children's lives, the more psychological dependence they may develop; excessive psychological dependence can negatively impact their lives. Smartphone overdependence can lead to difficulties in daily life. These difficulties can be categorized as school maladjustment, delinquency, criminal behavior, psychological instability, decreased social participation, and effects on adulthood. Regarding school maladjustment, children with high levels of smartphone dependence have lower levels of interest in school, lower levels of compliance with school norms, academic attitudes, and lower levels of school flexibility [3]. Because they can spend unlimited time playing games, chatting on SNS, and watching videos, they are bound to neglect their studies and school life by using their smartphones when they should focus on their studies. Smartphone overdependence negatively affects peer relationships and school performance [4]. Second, especially in childhood, when self-regulation skills are relatively weak, exposure to stimulating information and games can lead to externalized problems, such as distraction, interpersonal problems, and violence. Lack of proper control over smartphone use can lead to a lack of focus on schoolwork, such as trying to use it in class, which, in turn, leads to poor academic performance and can also affect relationships with teachers, making it difficult to adjust to school life. Overuse of smartphones increases the risk of adverse effects such as disruption of normal speech, access to pornography, overexposure to violent games, and human rights violations due to voyeurism. Third, when children are unable to use smartphones, they show anxious psychological states and complain of discomfort in their lives. Higher levels of overdependence also contribute to higher levels of depression, as it affects schoolwork and increases the amount of time spent on the device, further contributing to academic difficulties and demotivation. These depressive factors can lead to psychological problems because of increased anxiety about negative evaluation [5]. Additionally, more impulsive adolescents may be more likely to use their smartphones as a tool for immediate relief from negative emotions rather than acting in anticipation of the consequences of their actions. This leads to deficits in self-control and inhibition, which can directly contribute to smartphone addiction [6]. Fourth, smartphone overdependence reduced social engagement by replacing direct interpersonal socialization with smartphone activity. The more time adolescents spend immersed in their smartphones, the less time they spend interacting with people face-to-face, which greatly hinders interpersonal relationship formation and development [7]. This can lead to delays in social development, making children less flexible at school. Fifth, the risk of neurophysiological changes such as popcorn brain and digital dementia is greater in children and adolescents, and the risk of smartphone addiction in adolescents is approximately twice as high as in adults [8].

Concerns about the psychological, peer, and school problems that can arise from smartphone use have led to a growing interest in the factors that may exacerbate or mitigate smartphone overdependence. In addition, to prevent smartphone overdependence among elementary school students, research on the risk and protective factors for smartphone overdependence has been of interest.

First, we examined the variables related to demographics and found that girls and boys are at different risks of overdependence. Previous studies have shown that girls are more likely to be addicted to smartphones than boys [9-10] and that girls are more likely to be dependent on smartphones than boys because they use them as a tool to feel connected to their relationships. However, other studies found no effect of gender on smartphone dependence. Because of these conflicting findings, it is necessary to explore the effect of sex on smartphone overdependence by examining the interactions between sex and other factors [11]. At the school level, junior high school students were found to have a higher risk of smartphone addiction than elementary school students, which may be due to their susceptibility to

academic stress and inadequate coping strategies in the face of such stress, which contributes to smartphone overdependence. [12]. Family-related variables have been shown to have a significant impact on smartphone addiction. For example, parental control, coercion, and inconsistent parenting influence children's smartphone dependence [9], and parental addiction and less time spent with parents are associated with higher smartphone dependence among elementary school students [10]. Neglect and family conflicts at home also contribute to smartphone dependence in elementary school children, which is reported to be due to the inability to regulate emotionally unstable situations on one's own and the use of smartphones as an escape behavior [13].

Among individual-related variables, self-efficacy, self-control, anxiety, self-esteem, aggression, emotion regulation, depression, impulsivity, and stress have been reported to be associated with smartphone overdependence. Among these, negative emotions and emotional regulation are important factors affecting smartphone overdependence, and aggression, impulsivity, depression, and anxiety, or being unable to control these emotions, increase the likelihood of smartphone overdependence. In a study mediated by emotional dysregulation, middle school students who experienced intense emotional experiences were more likely to be overly dependent on their smartphones because they felt unpleasant and had difficulty regulating their emotions [14]. Self-esteem also increases the risk of smartphone dependence, as children with low self-esteem are more likely to have low self-regulation and are thus unable to control their impulses when using their smartphones, leading to excessive use [15]. Stress also has a direct and indirect impact on smartphone dependence, with peer stress leading to depression and anxiety and a tendency to turn to smartphones for relief, and stress from academic stress or conflicts with teachers also leading to smartphone dependence by focusing on the smartphone [16].

Emotional Regulation has received considerable attention. Although various negative emotions increase the risk of smartphone dependence, the level of control over these emotions also influences the level of smartphone dependence. In other words, people who recognize negative emotions and control them in various ways to reduce them while increasing positive emotions are less likely to try to suppress them through the same means as those with smartphone dependence. Several studies have shown that people with poor emotion regulation and impulsivity exhibit higher levels of smartphone dependence [17-18].

Another variable strongly related to smartphone dependence is peer relationships. In elementary schools, peer relationships become increasingly important as children move away from family relationships. Peer relationships provide a sense of belonging and connection, and self-esteem is built through achievement. Therefore, difficulties in peer relationships can cause negative emotions, such as loneliness, anxiety, and depression, which can lead to smartphone overdependence [19-20]. In other words, people may turn to their smartphones to avoid the negative emotions caused by difficulties in peer relationships. However, smartphones have both dysfunctional and positive functions in shaping peer relationships, as people use smartphones to communicate and build social relationships with their peers to create a sense of belonging and bonding. Therefore, it is necessary to determine the extent to which peer relationships play a role in increasing smartphone dependence in elementary school students.

School satisfaction was the third most significant variable associated with smartphone dependence. Tendencies toward smartphone addiction have been shown to have a direct negative impact on school adjustment [21]. For example, smartphone dependence can lead to school maladjustment due to excessive smartphone use, which can lead to an inability to concentrate on schoolwork and absenteeism. Smartphone dependence can also increase students' intention to drop out of school. Excessive smartphone use can also lead to conflicts with peers and teachers at school, as well as violations of school rules, which can hinder adjustment to school life [22].

Studies have shown that emotion regulation, peer relationships, and school satisfaction are important predictors of smartphone dependence. However, most of these studies have examined the relationship between a single factor and smartphone dependence or have looked for more likely mediating variables, such as self-esteem and resilience. In particular, few studies have examined how emotional regulation, peer relationships, and school satisfaction, which are important variables for elementary school students, affect smartphone overdependence. Furthermore, most studies to date have focused on adolescents and adults to explore the reality and severity of smartphone overdependence and theorize negative psychological and physical effects. Therefore, it is necessary to examine the relationship between smartphone overdependence and emotional regulation, peer relationships, and school satisfaction in elementary school students during the late school years, which is an important period of development.

By exploring the prevalence of smartphone overdependence among elementary school students and its influencing variables, this study aimed to provide a basis for designing education and programs to prevent smartphone overdependence among elementary school students, thereby helping them maintain a healthy school life by improving their emotional regulation, peer relationships, and school satisfaction. Therefore, this study aimed to investigate the

prevalence of smartphone dependence among elementary school students and explore the variables that influence smartphone dependence. The research questions were as follows: What is the current situation regarding smartphone overdependence among Korean elementary school students? Second, what variables affect smartphone overdependence among Korean elementary school students?

2. Method

2.1 Participants

The subjects of the study were 231 elementary school students in grades 4, 5, and 6 living in Chungcheongnam-do, central South Korea. The number of participants by grade was 100 (43.3%) in the fourth grade, 67 (29%) in the fifth grade, and 64 (27.7%) in the sixth grade (Table 1). The male-to-female ratio was 42.4% and 57.6% for boys and girls, respectively. Among families living together, 82.8% were parents, followed by single parents (11.6%), others (2.5%) in childcare facilities (2.2%), and grandparents (0.9%).

Table 1. Sociodemographic characteristics of the participants

			Family Types					
			Parents	Single parent	Grand parents	Child care facility	Others	전체
Male	4th	n	34	4	0	6	0	44
		%	36.2%	4.3%	.0%	6.4%	.0%	46.8%
	5th	n	23	1	0	1	1	26
		%	24.5%	1.1%	.0%	1.1%	1.1%	27.7%
	6th	n	20	1	1	2	0	24
		%	21.3%	1.1%	1.1%	2.1%	.0%	25.5%
	Total	n	77	6	1	9	1	94
		%	81.9%	6.4%	1.1%	9.6%	1.1%	100.0%
Female	4th	n	44	3	2	2	1	52
		%	33.6%	2.3%	1.5%	1.5%	.8%	39.7%
	5th	n	29	3	1	6	0	39
		%	22.1%	2.3%	.8%	4.6%	.0%	29.8%
	6th	n	27	5	0	6	2	40
		%	20.6%	3.8%	.0%	4.6%	1.5%	30.5%
	Total	n	100	11	3	14	3	131
		%	76.3%	8.4%	2.3%	10.8%	2.3%	100.0%

2.2. Procedure

Prior to the study, a questionnaire containing the purpose and explanation of the study was distributed to each school and handed out to the students. Written informed consent was obtained from the parents and children. Data were collected through face-to-face completion or via Google Forms questionnaires consisting of self-reports of gender, grade, family living together, location, time spent on a smartphone per day, days of smartphone use, age at first smartphone use, participation in smartphone prevention education, integrated smartphone dependence, emotion regulation, peer relations, and school satisfaction.

2.3 Data collection

2.3.1 Self-report Questionnaire

This form consisted of questions about elementary school students and their families, including gender, grade, family living together, location, time spent on a smartphone per day, days of smartphone use, age at first smartphone use, and

participation in smartphone prevention education. The categories for the family living together question were' parents, single parent, grandparents, childcare facility, and others. ' Questions about 'time spent on a smartphone in a day,' 'days of smartphone use,' and 'age of onset use of smartphone' were asked respondents to choose from a given time and date. 'Participation in smartphone overdependence prevention education' was measured by checking whether the respondent had ever received education anywhere, whether in school or out of school.

2.3.2 Smartphone Overdependence (S-scale)

The Smartphone Overdependence Inventory was used to measure the Smartphone Overdependence Inventory [23]. The scale consists of 10 items with sub-factors of loss of control (three items), prominence (three items), and problematic consequences (four items). Higher scores on the 4-point Likert scale indicated a higher tendency toward overdependence. A total score of 31 or higher was categorized as a " high-risk user" and indicated a loss of control over smartphone use, while a score between 23 and 30 is categorized as a " potential risk user" and indicates a weakening of control over smartphone use. In this study, the overall item reliability (Cronbach's α) was.898, and the subscale reliability was.892 for loss of control,.848 for prominence, and.781 for problematic consequences.

2.3.3 Peer Relationship

The peer relationship measure was the peer relationship portion of The Inventory of Parent and Peer Attachment-Revised (IPPA-R) [24] scale, which was adapted and used in Korean [25] and modified to be more accurate in meaning by comparing it to the original. The test consists of 25 items and three sub-factors (nine items for 'trust', 9 items for 'communication,' and seven items for 'anger and alienation'), each of which is scored on a 5-point Likert scale, with higher scores interpreted as more positive peer relationships. In this study, the overall item reliability (Cronbach's α) was.904, and the subscale reliability was.857 for trust,.868 for communication, and.726 for anger and alienation.

2.3.4 School Life Satisfaction Scale

The School Life Satisfaction Scale [26] consists of a total of 25 items and six subscales (three items for overall school life, four items for interpersonal relationships, four items for teaching and learning activities, four items for educational environment, four items for school rules and special activities, and six items for social support). It is a 5-point Likert-type scale, and its reliability (Cronbach's α) in this study was.954.

2.3.5 Emotion Regulation

Emotion regulation was measured using a scale [27] in which two subscales, self-regulation, and other-regulation, were preliminarily extracted from the four subscales used in several emotional intelligence scales [28-30]. This was based on previous research [30-31] that emotion regulation is a component of emotional intelligence, which is the ability to regulate one's own and others' emotions. The scale consists of a 5-point Likert scale with eight items on self-regulation and nine items on others. Self-regulation refers to the ability to appropriately change one's own perceived emotions, whereas other-regulation refers to the ability to respond appropriately to others' perceived emotions. In this study, the reliability (Cronbach's α) was.899.

2.4 *Data Analysis*

The following methods were used to analyze the data: First, one-way analysis of variance (ANOVA) was used to analyze differences between groups, and Scheffé's test was used for post-hoc analysis. Second, Pearson correlation analysis was conducted to examine the correlation between each variable. Third, to examine the relationship between the variables that affect the intention to drop out of school, a multiple regression analysis was conducted with smartphone overdependence as the dependent variable and average time spent using a smartphone, frequency of smartphone use, age at first smartphone use, peer relationships, school satisfaction, and emotional regulation as independent variables. When performing multiple regression analysis, a stepwise method was used to enter each variable step-by-step, and the criteria for determining multiple collinearity were a correlation coefficient (r) of.9 or higher, a tolerance (TOL) of less than 0.1, and a variance inflation factor (VIF) of more than 10. The Durbin-Watson test result was considered normal if it was between 1.5 and 2.5.

3. Results

3.1 Descriptive statistics

The average daily time spent on smartphones by elementary school students in South Korea was 3.3 hours. The higher the grade, the more time was spent, and there was a significant difference in the average time between grades. The overall mean frequency of use in a week was 6.21 days, indicating almost daily use. There was no significant mean difference between grades, but students in higher grades used it more days per week. The average age at first smartphone use was 8.41 years. The average age at first use increased as the grade level increased, with fourth graders

having a significantly lower average age at first use than fifth and sixth graders. This suggests that the younger the age at first smartphone use, the younger the age at first smartphone use. Peer relationships and emotional regulation did not show significant mean differences between the grades. In contrast, school satisfaction showed a significant mean difference between grades, but post hoc analyses did not show a direct grade difference. Overall, satisfaction with school life decreased as the grades increased.

Table 2. Descriptive statistics of related variables

Variables		Grade					
		4th (*n*=100)	5th (*n*=67)	6th (*n*=64)	합계 (*n*=231)	*F*	Post hoc
Average Time spent	*M*	2.59	3.42	4.29	3.30	13.70***	6th>5th>4th
	SD	1.67	2.18	2.31	2.13		
Frequency of Use	*M*	6.08	6.27	6.36	6.21	0.60	
	SD	1.718	1.702	1.547	1.665		
First Age	*M*	7.47	8.70	9.62	8.41	20.24***	5th>4th, 6th>4th
	SD	2.096	2.232	2.121	2.317		
Peer Relationships	*M*	90.05	85.70	88.42	88.34	1.73	
	SD	14.335	16.649	13.560	14.888		
School Life Satisfaction	*M*	95.58	90.73	89.05	92.36	3.18*	
	SD	17.318	18.034	16.720	17.531		
Emotion Regulation	*M*	64.86	66.34	65.44	65.45	0.38	
	SD	11.106	9.543	11.212	10.679		

Note. Ave_T: Average Smartphone Usage Time spent per day, Freq_U: Frequency of Use in a week, First_A: age at first smartphone use, PR: Peer relationships, SLS: school life satisfaction, ER: emotion regulation, ***p<.001, *p<.05.

3.2. The state of smartphone dependency

Of the study participants, 75.3% were regular smartphone users, and 24.7% were at risk (22.5% potential risk and 2.2% high-risk). The proportion of potentially at-risk smartphone users increased with each grade level (Table 3). Sixth graders comprised 39.1% at risk (37.5% potentially at risk + 1.6% at high-risk), fifth graders 23.9% at risk (20.9% potentially at risk + 3.0% at high-risk), and fourth graders 16.0% at risk (14.0% potentially at risk + 2.0% at high-risk). Sixth-grade boys had the highest percentage of at-risk students (45.9 %), indicating a high-risk of smartphone dependence.

Table 3. Cross tabulation table of grade, gender, smartphone overdependence group

Grade	Gender		Smartphone overdependence group			Total
			General	Potential	High-risk	
4th	Male	*n*	35	9	2	46
		%	76.1%	19.6%	4.3%	100.0%
	Female	*n*	49	5	0	54
		%	90.7%	9.3%	.0%	100.0%
	Total	*n*	84	14	2	100
		%	84.0%	14.0%	2.0%	100.0%
5th	Male	*n*	19	8	1	28
		%	67.9%	28.6%	3.6%	100.0%
	Female	*n*	32	6	1	39

Grade	Gender		Smartphone overdependence group			Total
			General	Potential	High-risk	
		%	82.1%	15.4%	2.6%	100.0%
	Total	*n*	51	14	2	67
		%	76.1%	20.9%	3.0%	100.0%
6th	Male	*n*	13	10	1	24
		%	54.2%	41.7%	4.2%	100.0%
	Female	*n*	26	14	0	40
		%	65.0%	35.0%	.0%	100.0%
	Total	*n*	39	24	1	64
		%	60.9%	37.5%	1.6%	100.0%

When examining the prevalence of smartphone dependence prevention training by grade level, 73.9% of the participants reported having received training. The percentage of respondents who had participated in smartphone dependence prevention training increased proportionally with grade level (see Table 4). Only 57.6% of fourth graders reported having received training, compared to 92.2% of sixth graders. At-risk students are less likely than the general population to participate in education. In the fifth grade, only 62.5% of at-risk students reported any educational experience, compared to 86.3% of the general population; in the sixth grade, at-risk students were also less likely to have any educational experience than the general population.

Table 4. Cross tabulation table of grade, gender, smartphone overdependence group

Grade	Prevention Education Participation		Smartphone overdependence group		전체
			General	Risk	
4th	Yes	*n*	48	9	57
		%	57.8%	56.3%	57.6%
	No	*n*	35	7	42
		%	42.2%	43.8%	42.4%
5th	Yes	*n*	44	10	54
		%	86.3%	62.5%	80.6%
	No	*n*	7	6	13
		%	13.7%	37.5%	19.4%
6th	Yes	*n*	38	21	59
		%	97.4%	84.0%	92.2%
	No	*n*	1	4	5
		%	2.6%	16.0%	7.8%

In terms of average smartphone usage time per day, 24.2% of students reported spending two hours per day, followed by three hours (21.1%), one hour (24.2%), and four hours (10.6%) (See Table 5). While this is consistent with the general student population, students in the at-risk group were more likely to spend three hours (22.2%), followed by eight hours (16.7%) and seven hours (14.8%). We can see that the more dependent the students are, the higher the percentage of students who spend a lot of time on their phones. More than seven hours of smartphone use means that elementary school students use their phones almost every minute from the time they get off school until they go to sleep.

Table 5. Cross tabulation table of smartphone overdependence group and average smartphone usage time per day

Smartphone overdependence		Average smartphone usage time per day (hour(s))									전체
		0	1hr	2hr	3hr	4hr	5hr	6hr	7hr	8hr	
General	*n*	4	36	48	36	20	8	11	4	6	173
	%	2.3%	20.8%	27.7%	20.8%	11.6%	4.6%	6.4%	2.3%	3.5%	100.0%
Risk	*n*	1	4	7	12	4	4	5	8	9	54
	%	1.9%	7.4%	13.0%	22.2%	7.4%	7.4%	9.3%	14.8%	16.7%	100.0%
Total	*n*	5	40	55	48	24	12	16	12	15	227
	%	2.2%	17.6%	24.2%	21.1%	10.6%	5.3%	7.0%	5.3%	6.6%	100.0%

When looking at the average frequency of smartphone use over a week, 77.4% of all students reported daily use (see Table 6). This compares to 73.0% of students in the general population who reported daily use and 91.1% of at-risk students who reported daily use.

Table 6. Cross tabulation table of smartphone overdependence group and frequency of use in a week

Smartphone overdependence		Frequency of Use in a week (day(s))								전체
		0	1	2	3	4	5	6	7	
General	*n*	2	2	9	10	8	9	7	127	174
	%	1.1%	1.1%	5.2%	5.7%	4.6%	5.2%	4.0%	73.0%	100.0%
Risk	*n*	1	0	1	2	0	0	1	51	56
	%	1.8%	.0%	1.8%	3.6%	.0%	.0%	1.8%	91.1%	100.0%
Total	*n*	3	2	10	12	8	9	8	178	230
	%	1.3%	0.9%	4.3%	5.2%	3.5%	3.9%	3.5%	77.4%	100.0%

3.3. Group difference analysis of smartphone overdependence

There was no significant difference in mean smartphone dependence by gender, but there was a significant difference by grade (see Table 7). Post hoc tests showed a significant difference between 6th and 4th graders, and there was no significant difference between those who had participated in a smartphone education program and those who had not.

Table 7. Descriptive statistics and group comparison results of smartphone overdependence

Variables		*n*	*M*	*SD*	*F*	Post hoc
Gender	Male	98	19.82	6.63	2.19	
	Female	133	18.65	5.29		
Grade	4th	100	17.85	5.36	5.05**	4th < 6th
	5th	67	19.57	5.63		
	6th	64	20.73	6.62		
Education	Yes	170	19.08	5.62	0.08	
Participation	No	60	19.33	6.77		

Note. $^{**}p<.01$.

3.4 Variables affecting Korean elementary school students' smartphone overdependence

Smartphone dependence was positively related to the average time spent on a smartphone and frequency of use but negatively related to peer relationships, school satisfaction, and emotional regulation (see Table 8). Age at first smartphone use was not associated with smartphone overdependence. School satisfaction and peer relationships were highly positively correlated, whereas emotional regulation was moderately positively correlated to peer relationships and school satisfaction.

Table 8. Descriptive statistics and correlations between smartphone overdependence and related variables

Variables	SO	Ave_T	Freq_U	First_A	PR	SLS	ER
Ave_T	.360***	1					
Freq_U	.278***	.351***	1				
First_A	.017	-.042	-.252***	1			
PR	-.196**	-.110	.000	-.036	1		
SLS	-.265***	-.141*	-.041	-.084	.702***	1	
ER	-.362***	-.116*	-.081	.015	.432***	.603***	1
M	18.99	3.34	6.29	8.42	88.58	92.46	65.69
SD	5.61	2.12	1.55	2.30	14.85	17.02	10.02

Note. SO: Smartphone Overdependence, Ave_T: Average Smartphone Usage Time per day; Freq_U: Frequency of Use in a week; First_A: First Age of Smartphone Use, PR: Peer Relationships, SLS: School Life Satisfaction. ER: Emotion Regulation, $^{***}p<.001$, $^{**}p<.01$, $^{*}p<.05$.

To explore the relevant variables affecting smartphone overdependence, we conducted a multiple regression analysis and found that the relevant variables selected in this study could explain approximately 26.2% (R^2=.262) of smartphone overdependence (Table 9). Among them, average usage time (β =0.260, p<.001), usage frequency (β =.181, p<.01), and emotional regulation (β =-0.296, p<.001) had significant effects, but age of first use (β =0.075, p >.05), peer relationship (β = -0.022, p >.05), and school satisfaction (β = -0.021, p >.05) did not have significant effects.

Table 9. Results of multiple regression analysis of the effect of related variables on smartphone overdependence

Dependent Variable	Predictors	*B*	*SE*	*β*	*t*	*F*	R^2
SO	(Intercept)	23.284	3.307		7.040***	12.844***	.262
	Ave_T	0.689	0.167	0.260	4.126***		
	Freq_U	0.657	0.234	0.181	2.807**		
	First_A	0.183	0.148	0.075	1.237		
	PR	-0.008	0.031	-0.022	-0.270		
	SLS	-0.007	0.031	-0.021	-0.220		
	ER	-0.166	0.041	-0.296	-4.033***		

Note. SO: Smartphone Overdependence, Ave_T: Average Smartphone Usage Time per day; Freq_U: Frequency of Use in a week; First_A: First Age of Smartphone Use, PR: Peer Relationships, SLS: School Life Satisfaction. ER: Emotion Regulation, ***p<.001, **p<.01

4. Discussion

In this study, we examined the prevalence of smartphone overdependence among elementary school students in South Korea and the factors that influence smartphone overdependence. The following is a discussion of these findings.

The first result related to smartphone overdependence among elementary school students in South Korea was that 24.7 percent of elementary school students were in the high-risk group. This is lower than the at-risk rate of 37.0% in 2021, which is the yearly increase in smartphone dependence among adolescents (aged 10–19 years) according to the 2021 Smartphone Dependence Survey (30.2 % (26.4% potential risk, 3.8% high-risk) in 2019, 35.8 % (30.8% potential risk, 5.0 high-risk) in 2020, and 37.0 % (31.3% potential risk, 5.7% high-risk) in 2021). However, these figures include middle and high school students, making simple comparisons difficult [32]. However, it can be seen that there has been an increase compared to the 19.9% (17.8% potential risk, 2.1% high-risk) found in the study of smartphone addiction and usage among adolescents [33]. Unlike adults, elementary school students are in a period of active brain, physical, and cognitive development, and the damage caused by smartphone use may be more serious than that in adults. Therefore, early intervention measures are needed to prevent smartphone addiction in elementary school students.

Second, the percentage of overdependence increased as the grade level increased. In particular, 6th graders and 4th graders showed a significant difference in their smartphone overdependence scores. This is consistent with a study that found that 6th graders had significantly higher levels of smartphone addiction than 4th and 5th graders [13], and A study of influencing factors for smartphone addiction in elementary school students also found that 6th graders had higher levels of smartphone addiction than 5th graders [34]. This is also consistent with the finding that the proportion of high-risk and potentially high-risk students increases significantly by grade level [35]. It is possible that an increase in smartphone literacy as the grade level increases leads to an increase in the number of things that can be done on a smartphone and in the number of applications that can be used, which, in turn, leads to an increase in the amount of time spent on a smartphone. It is also possible that sixth graders are more likely to use their smartphones to text or chat as a means of strengthening peer relationships than other grades because they enter adolescence, a period of developmental self-identity when they are more sensitive to external interference and stimuli and are more likely to spend more time in school and learn about the importance of bonding and interacting with their peer groups. While this is a possibility, it is necessary to expand the number of subjects in the study to determine whether this is a universal result. If so, it is necessary to conduct in-depth research to determine the exact reason for the increase.

Third, boys were at a higher risk of overdependence than girls, but this finding differs from previous gender differences in mobile phone overdependence research, which suggests that girls use their phones more because they use them as ties to people around them [36]. This finding is also consistent with a study that addressed the emotional and behavioral consequences of smartphone overuse, which found that boys were more likely to overuse smartphones than girls and that they were more likely to be addicted because they mostly used their smartphones for gaming [37]. Girls are more likely to use mobile messaging and SNS for socializing purposes, while boys are more likely to play online games, which are more entertainment-oriented; the immediacy of accessibility may have increased the risk of smartphone

overdependence among adolescent boys who seek immediate rewards. Conversely, female students were more likely than males to use smartphones for communication, which is attributed to the feminine characteristics of smartphones, where girls value maintaining relationships and sharing emotions with others [38], and is different from the results of previous studies that showed that girls were at a higher risk of addiction than boys [39-41]. However, since the subjects of these studies were mainly middle and high school students, adolescents are in the process of self-formation, identity development, and interaction with peer groups and are emotionally sensitive and prone to emotional changes and psychological dependence. The risk of smartphone overdependence among female students is likely higher because they use smartphones to promote psychological stability through emotional exchange with peers. Therefore, it is necessary to continue research on sex differences in relation to smartphone overdependence.

Fourth, we examined the prevention education status of smartphone overdependence and found that as the grade level increased, the experience of participating in education increased proportionally; however, the risk group was less likely to participate than the general group. According to the 2021 Smartphone Overdependence Survey, 44.8% of adolescents (aged 10–19 years) reported receiving preventive education, mainly at school (90.9%). By type of overdependence, 10.3% of the general group and 13.8% of the high-risk group experienced preventive education slightly more than the general group [32], which is different from the findings of this study. This study included middle and high school students, unlike this study, which focused on elementary school students; therefore, it is difficult to make comparisons. In addition, there have been no previous studies on the experience of participating in preventive education by grade among elementary school students. Therefore, it is difficult to compare and analyze this study with previous studies. If you look at the smartphone prevention education that elementary school students have participated in so far, it is mostly lecture-style prevention education that invites professional lecturers from the Korea Information Society Agency, Youth Counseling and Welfare Center, and Smart Shelters rather than content that elicits interest and provides practical help, so it may seem boring to students who are accustomed to immediate rewards and stimulus responses. Another type of prevention education is short-term activities, such as poster drawing, club activities, participation in outside camps, or group counseling programs; however, the proportion is extremely small. These preventive education programs target the entire student body and are not sufficiently differentiated to target potentially at-risk or high-risk students.

Fifth, with regard to the amount of time spent on smartphones, while most of them were using 1-3 hours, the at-risk group was using 7-8 hours after school. This result is consistent with Kim's study, which found that the highest percentage of total daily smartphone use was less than 1-2 hours at 30.0% [42], and with a study that found a close relationship between average daily smartphone use and smartphone overuse, leading to higher rates of dependence [43]. In addition, studies have shown that longer usage times increase vulnerability to addiction, and children with internalized emotional problems in the smartphone overuse group are more vulnerable to addiction [37]. However, scholars have differing opinions regarding whether smartphone use duration is a factor. However, the consensus is that the more time spent on a smartphone, the more likely it is to be addictive, and more time spent on a smartphone tends to be associated with a higher risk of smartphone dependence [43-44]. This may be because the more emotionally disturbed a person is, the less self-control and regulation they have, such as the ability to delay gratification, patience, resist temptation, and delay gratification, and the less they can properly control their emotional experiences and expressions and cope with chaotic emotional situations, which may have contributed to their increased use of smartphones to satisfy immediate needs and relieve negative emotions.

Sixth, regarding the frequency of smartphone use, only 73.0% of the general population reported daily use, whereas 91.1% of the at-risk group reported daily use. This result suggests that the frequency of leisure pursuit use, such as listening to music and watching videos, does not affect smartphone overdependence, but games can affect smartphone overdependence [11]. In addition, Korean elementary students may share emotional intimacy and play games through messengers and SNS using smartphones independent of time and place, as the burden of study and study time increases, and there is not enough time to meet friends offline. In addition, due to changes in daily life caused by COVID-19, school classes were replaced by online classes, and external activities were reduced; therefore, Korean elementary students who lacked control due to restrictions on activities such as communication, games, and media viewing using smartphones may have increased the frequency and duration of smartphone use, leading to overdependence.

Next, we conducted a multiple regression analysis to examine related variables that influence smartphone overdependence and found that average usage time, usage frequency, and emotional regulation were significant variables, whereas age at first use, peer relationships, and school satisfaction were not. First, the fact that average time and frequency of use were significant variables is consistent with the results of a study showing that smartphone addicts had the highest number of hours of daily use and frequency of use compared to normal users [45]. First of all, it has been reported that smartphone usage time is a risk factor for addiction [10], and average daily smartphone usage time

has a high impact on overuse [43]. This may lead to addiction because of the advantages of convenience and accessibility without time and space constraints by utilizing various apps on smartphones to connect in real-time, as shown in previous results on the difference in the frequency of smartphone use between normal and at-risk students.

Second, the results related to emotion regulation are consistent with those of a study that found that poor emotion regulation among middle school students was negatively associated with smartphone addiction [46]. This suggests that children and adolescents who experience uncomfortable and strong emotions may experience difficulties in regulating their emotions due to a lack of awareness of their feelings and coping strategies. This difficulty in emotional regulation suggests that smartphones help people cope with negative emotions by providing quick and easy distraction from relevant situations or events, thus contributing to smartphone overdependence. This is also consistent with the findings that intense emotional experiences may directly influence smartphone addiction but have been found to have a greater impact on smartphone overdependence through the mediation of emotional dysregulation [47]. Developmentally, children tend to feel relatively strong emotions and have immature emotion regulation skills; therefore, they may express their emotions through maladaptive behaviors. They may also have strong emotional reactions to minor stimuli, such as excitement or anger. This suggests that if they can recognize and articulate their emotional state, they may be able to cope with stressful situations in a healthy and adaptive way. However, if they do not, their emotional dysregulation may lead to dysfunctional coping behaviors and an increased likelihood of over-reliance on smartphones to quickly relieve negative emotions.

Third, peer relationships, on the contrary, were not found to be a significant predictor of smartphone dependence, which is similar to the finding that no effect was found between smartphone dependence and peer relationships [48], which is consistent with the finding that peer relationships do not affect smartphone dependence [49] Nevertheless, previous studies have found that smartphone overdependence both influences and is influenced by peer relationships. This difference in the influence of peer relationships on smartphone overdependence may be due to the fact that elementary school students use smartphones not because they have poor peer relationships but because they use them to share information and use various contents such as SNS and messengers, which have a positive effect on their ability to communicate with others in real-time and help them form, maintain, and strengthen relationships. This is supported by a study comparing the predictive factors affecting cell phone addiction among elementary and middle school students, which found that smartphones play a role in strengthening and expanding intimacy with peers as they are used in daily life to exchange feelings and emotions, share common interests, and exchange experiences and information with peers [10].

Fourth, school life satisfaction was not a significant predictor of smartphone overdependence, which differs from the findings of several studies that found school life satisfaction to be a predictor of lower smartphone overdependence. School satisfaction is not consistent with the finding that a tendency toward smartphone addiction may have a direct negative impact on school adjustment [21], nor is it consistent with the finding that smartphone addiction may hinder school adjustment by causing conflicts with peers and teachers and violating school rules [22]. Similar to peer relationships, school satisfaction may not lead to smartphone addiction but rather indirectly by affecting other mediators such as emotion regulation, peer relationships, aggression, and self-esteem [50-51]. Future research should explore the relationship between school satisfaction and smartphone overdependence in detail.

Finally, the age at first use was not found to have a significant effect. There are no previous studies on this. However, as the age at first use decreases, the experiences of infants and children are likely to become lifestyle habits, as their mental development is not yet fully developed; therefore, it is likely that it will affect not only adolescence but also adulthood. Therefore, further research is needed to better understand how age at first use affects smartphone overdependence.

The significance of this study is that it focuses on elementary school students to investigate the prevalence of smartphone dependence among elementary school students and the variables that influence smartphone dependence. As the age of smartphone use is getting younger and younger, the risk of smartphone overdependence among elementary school students is increasing, and the need for prevention and education from an early age when children are vulnerable to the negative effects of smartphones has emerged.

Furthermore, the study proved that the phenomenon of smartphone overdependence is multivariate rather than a causal effect of a single variable by examining various variables that influence smartphone overdependence, such as peer relationships, emotional regulation, and school satisfaction. This suggests that a multifaceted approach is needed to prevent smartphone overdependence in multiple settings such as school, home, and peer relationships. In particular, it suggests that the paradigm of prevention should change from simply providing information on the dangers of smartphone overdependence to developing emotion regulation programs to improve students' emotion regulation

capabilities and educating students on social adaptation skills, such as empathy, listening, and conflict management skills, to improve peer relationships.

Based on the above discussion and conclusions and the limitations of this study, we make the following suggestions. First, it is difficult to generalize the results to all elementary school students in Korea because the subjects were located in Chungcheongnam-do Province. Therefore, future studies should include elementary school students from a wide range of regions to increase the validity of this study. Studies have shown that smartphone use varies according to socioeconomic status. Hence, it is necessary to expand the study to other regions, such as urban, rural, and industrial cities. In addition, the relationship between smartphone overdependence and demographic variables in this study is somewhat different from that in previous studies, which may be due to the sampling of the study population; therefore, it is necessary to conduct a study with different sampling methods. Second, it examined the relationship between smartphone overdependence and emotional regulation, peer relationships, and school satisfaction among elementary school students. However, previous studies have shown that various variables affect smartphone overdependence and that these variables are interrelated and comorbid. Therefore, it is necessary to examine the structural relationships among various variables to obtain accurate information on smartphone overdependence among elementary school students. Third, it is impossible to rule out the possibility of bias or insincere responses based on the subjectivity of the respondents because this study used a self-report measure for elementary school students. Therefore, in subsequent studies, it will be necessary to ensure objectivity using multiple measurement methods, such as teacher, parent, and peer reports, in addition to self-reporting scales.

References

[1] Korea Communications Commission. (2022). 2022 Broadcast Media Usage Behavior Survey. Seoul: Author.

[2] Ministry of Science and ICT, National Information Society Agency. (2022). *2022 The survey on smartphone overdependence*. Seoul: Author.

[3] Kim, J. Y. (2013). Effect of Smart-phone addiction on school resilience in elementary school students. *Journal of Transactional Analysis & Counseling, 3*(2), 63-79.

[4] Choi, H. S., Lee, H. G., & Ha, J. C. (2012). The influence of smartphone addiction on mental health, campus life and personal relations: Focusing on K university students. *Journal of the Korean Data Information Society, 23*(5), 1005-1015.

[5] Kim, H. S. (2015). *Effects of the adolescents' smartphone addiction on depression, anxiety, and aggressiveness*. Unpublished doctoral thesis, Venture University Seoul, Korea.

[6] Yim, M. A. (2020). *The influence of adolescents' sensation seeking on smartphone addiction: Dual mediation effects of impulsivity and self-control and the moderated mediation effect of family health*. Unpublished doctoral thesis, Seoul Venture University.

[7] Kim, B. N. (2013). Effect of smart-phone addiction on youth's sociality development. *The Journal of the Korea Contents Association, 13*(4), 208-217.

[8] Cheon, Y. B. (2013). Smart phone addiction and prevent problem in teenagers. *e-Business Review, 14*(1), 125-139.

[9] Lee, C. H. (2017). Meta-analysis of factors affecting smartphone addiction among elementary, middle, and high school students. *Journal of Community Welfare Policy, 28*, 130-157.

[10] Kwon, T. Y. (2021). Comparison on predictors affecting smartphone addiction of elementary school student and middle school students. *Journal of Social Sciences, 14*(1), 57-86.

[11] Bae, S. M. (2015). Convergence and substitutability : A case study of the United States and the United Kingdom. *Informatization Policy, 22*(3), 36-46.

[12] Jeong, J. S., & Lee, H. K. (2020). A study on factors affecting smartphone addiction in children and adolescents: Focusing on the comparison between 4th-grade elementary school students and 1st-grade middle school students. *Journal of Youth Welfare, 22*(4), 211-241.

[13] Choi, J. O. (2015). The impacts of smartphone addiction on academic grade of elementary school students: Multiple mediating effects of empathy impairment & school adjustment. *Youth Facility & Environment, 13*(2), 43-54.

[14] Lee, H. J., & Ha, E. H. (2016). The mediating effects of difficulties in emotional regulation on the relationship

between the affect intensity and smartphone addiction of middle-school students. *Korean Journal of Play Therapy, 19*(1), 35-51.

[15] Kim, J. H., & Jung, I. K. (2015). The moderating effects of perceived father's rearing attitudes on the relationship between self-efficacy and smart-phone addiction in adolescents. *Journal of Korean Home Economics Education, 27*(1), 111-126.

[16] Jeon, H. S., & Chun, J. S. (2019). Effects of peer and school stress on smartphone addiction among adolescents: Focusing on the mediating effects of depression / anxiety. *Journal of Youth Welfare, 21*(1), 1-28.

[17] Choi, D. H., & Lee, H. J. (2017). The mediating effects of emotion regulation difficulties on the relationship between loneliness and smartphone addiction. *Cognitive Behavior Therapy in Korea, 17*(1), 87-103.

[18] Lee, H. J., & Ha, E. H. (2016). The mediating effects of difficulties in emotional regulation on the relationship between the affect intensity and smartphone addiction of middle-school students. *Korean Journal of Play Therapy, 19*(1), 35-51.

[19] Kim, H. S., & Byun, S. H. (2015). Impact smartphone addiction of adolescents' peer relationships. *Asia-Pacific Journal of Business Venturing and Entrepreneurship, 10*(5), 117-125.

[20] Jang, S. H. (2019). The relationship between the peer relationships and smart phone addiction: Self-control as a mediating variable. *The Korean Journal of Child Education, 28*(2), 167-179.

[21] Moom, J. M., & Choi, J. O. (2015). Smartphone addiction tendency of elementary school students influencing school adjustment and academic achievement: Mediating effect of ADHD tendency. *The Journal of Special Children Education, 17*(1), 263-292.

[22] Lee, J. M., & Cho, B. R. (2015). Effects of self-control and school adjustment on smartphone addiction among elementary school students. *International Journal of Contents, 11*(3), 1-6.

[23] Kwon, S. J., & Eom, N. R. (2016). *Final report on smartphone overdependence scale reorganiz*ation (2016 Digital culture forum policy research report). Daegu: National Information Society Agency.

[24] Gullone, D., & Robinson, K. (2005). The inventory of parent and peer attachment-revised: A psychometric investigation. *Clinical Psychology and Psychotherapy, 12*, 67-79.

[25] Hwang, S. Y. (2007). Parental attachment, parental monitoring, peer attachment, association with deviant peers, and problem behaviors: An examination of junior-high school students. Unpublished master's thesis, Chung-Ang University.

[26] Kim, J. Y. (2009). A study on the development and validation of the school life satisfaction scale for high school students. Unpublished doctoral thesis, Wonkwang University.

[27] Cho, I. Y. (2007). The effect of mother' parenting attitudes and children' emotion regulation toward children' social competence: An analysis of structural relationships and explanatory variables. Unpublished master's thesis, Han Yang University.

[28] Goleman, D. (1995). *Emotional intelligence*. New York: Bantam Books.

[29] Saarni, C. (1990). *Psychometric properties of the parental attitude toward Children's Expressiveness Scale (PACES)*. Unpublished Manuscript, Sonama State University, (ERIC Document Reproduction Service No. ED 317-301).

[30] Salovey, P. J., & Mayer, D. (1990). Emotional intelligence. *Imagination, Cognition, and Personality, 9*, 185-211.

[31] Moon, Y. R. (1996). *A study on emotional intelligence measurement in Korean students: The concept of new intelligence, emotional intelligence* (Professor Peter Salovey's lecture materials, pp. 59-89). Samsung Life Social Health Research Institute.

[32] Ministry of Science and ICT, National Information Society Agency. (2022). *2021 The survey on smartphone overdependence*. Seoul: Author.

[33] Kim, K. T. (2017). Smartphone addiction and the current status of smartphone usage among korean adolescents. *Studies in Humanities and Social Sciences, 56*, 115-142.

[34] Ryu, S. I., & Cho, I. S. (2015). Factors affecting smartphone addiction among elementary school students. *Journal of the Korea Academia-Industrial Cooperation Society, 16*(9), 6180-6189.

[35] Lee, S. J. (2014). Analysis of smartphone addiction status and risk among elementary students. *Journal of The*

Korean Association of Information Education, 18(2), 203-212.

[36] Kim, S. N., & Na, M. S. (2008). A study on gender differences shown in the utilization of mobile. *Journal of Communication Science, 8*(3), 165-200.

[37] Baek, H. W., Shin, Y. M., & Shin, K. M. (2014). Emotional and behavioral problems related to smartphone overuse in elementary school children. *Journal of The Korean Neuropsychiatric Association, 53*(5), 320-326.

[38] Kim, K. T., Lee, H. J., & Moon, S. I. (2016). Exploring the effects of network size, usage behaviors, and assimilation for peer relations on adolescents' smartphone addiction symptoms. *Korean Journal of Broadcasting and Telecommunication Studies, 30*(4), 5-40.

[39] Kang, Y. H., & Park, S. H. (2013). Factors affecting smartphone addiction in high school students. *Journal of the Korean Data Analysis Society, 15*(4), 2103-2116.

[40] Moon, J. H., & Park, H. S., & Yang, K. H. (2017). An investigation for criterion of smartphone overuse in adolescents: From Korea youth risk behavior web-based survey. *Journal of Knowledge Information Technology and Systems, 16*(5), 957-969.

[41] Bae, J. H. (2006). An impact of types of public places and human factors of users on uses of mobile content. *Journal of Communication Science, 6*(4), 133-171.

[42] Kim, Y. M. (2015). The influence of excessive use of smartphone on school adaptation of among adolescents: Mediating effects of social support and self-control. Unpublished doctoral thesis, Silla University.

[43] Ju, S. J & Cho, S. S. (2015). A Study on the discriminating factors of youth`s smartphone addiction: Focusing on daily average smartphone usage time, impulsivity, peer Relationships, mother`s authoritarianism-rearing attitudes. *Korean Journal of youth welfare, 17*(1), 97-118.

[44] Kim, D. I., Chung, Y. J., Lee, Y. H., Kang, M. C., & Jeon, H. J. (2015). Effect of smartphone addiction on psychological problem by Mixed Regression Analysis. *Korean Journal of Counseling, 16*(4), 283-300.

[45] Kim, J. H. (2017). Psychological, behavioral characteristics, and human relationship of adolescent addicted to smartphone, internet and games. Unpublished doctoral thesis, Inha University.

[46] Yoon, B. Y., & Jung, E. J. (2016). Effects of middle school students' emotion regulation ability on smart phone addiction: The mediating effect analysis of aggression. *Korean Journal of Interdisciplinary Therapy, 8*(1), 5-30.

[47] Lee, H. J., & Ha, E. H. (2016). The mediating effects of difficulties in emotional regulation on the relationship between the affect intensity and smartphone addiction of middle-school students. *Korean Journal of Play Therapy, 19*(1), 35-51.

[48] Park, S. H. (2020). Self-regression cross-analysis on the relationship between adolescents' cellular phone dependence and peer relationship and school life adaptation. *Journal of Transactional Analysis & Counseling, 10*(2), 67-85.

[49] Jang, J. W., & Heo, G. (2017). A study on the structural relationship among adolescents' depression, parenting style, peer relation, and cell phone dependency for smart learning. *Journal of Internet Computing and Services, 18*(4), 89-97.

[50] Park, E. H., & Lee, E. T. (2015). The longitudinal structural relationship between mobile phone dependency, mental health, and school life adjustment. *Studies on Korean Youth, 26*(1), 171-193.

[51] Kim, D. E., & Shin, J.-I. (2016). The Relationship between Social Factor, Dependency, Addiction, and Behavioral Intentions of Smartphones. *International Journal of u - and e - Service, Science and Technology*, 9(10), 255-264, doi: 10.14257/ijunnesst.2016.9.10.24.