

Article

The Relationships between Smartphone Addiction of Middle School Students and Smartphone Usage Types, Depression, ADHD, Stress, Interpersonal Problems, and Parenting Attitude.

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Abstract: The purpose of this study was to examine the relationships between smartphone addiction of middle school students and smartphone usage types, depression, attention deficit hyperactivity disorder (ADHD), stress, interpersonal problems, and parenting attitude. This study was also performed with the aim of verifying the relationships among depression, ADHD, perceived stress, interpersonal problems, and parenting attitude, which are predictors of smartphone addiction. The subjects of this study were 487 local middle school students (234 males and 253 females). The measurement instruments used were the smartphone addiction scale, depression scale (PHQ-9), ADHD scale (K-ARS), perceived stress scale (PSS), interpersonal problem scale (KIIP-SC), and the parenting attitude scale. This study identified the relationships between the variables with correlation analysis and examined the predictors of smartphone addiction with hierarchical multiple regression analysis. According to the study results, the factors that influenced smartphone addiction were gender, stress, and interpersonal problems. In addition, when the confounding variables of smartphone addiction were controlled to examine the effects of smartphone usage types on smartphone addiction, social media use and music/videos were found to have a positively significant effect on smartphone addiction while study had a negatively significant effect. The order of the usage types with the highest influence on smartphone addiction was enjoying music/videos, social media use, and study. This suggests that selective intervention depending on the main smartphone usage type can be effective.

Keywords: Smartphone Addiction; Middle School Students; Smartphone Usage Types; Depression; Parenting Attitude

1. Introduction

Smartphones are indispensable tools for people of all ages around the world today, and it has become difficult to imagine everyday life without a smartphone. The use of smartphones has brought drastic changes to our lives, habits, social activities, values, and family relationships and social interactions [1, 2]. Especially for the youth who are sensitive to new technology and media use, smartphones have become an important part of their lives [3]. According to a recent study, the domestic middle and high school students' smartphone ownership rate exceeded 95%, which is about 8% higher than that of all age groups (87.2%) (Korea Information Society Development Institute, 2019).

Adolescents are more susceptible to smartphone addiction than adults, which can be attributed to the former's use of various contents for the purpose of interaction with peers and entertainment with their smartphones [4, 5] and their neurobiological vulnerability as discussed in the dual processing theory [6, 7]. In fact, a domestic study has reported that the smartphone overdependence (addiction) prevalence rate of adolescents was 30.2%, which is higher than that of adults, 18.8% (National Information Society Agency, 2020).

Smartphones are used for a variety of purposes, including learning, information search, social communication, and entertainment [8]. Compared to traditional types of computers, the portability and connectivity of smartphones allow users to easily access information anytime and anywhere. Therefore, adolescent users who are vulnerable to behavioral addiction, are more likely to develop an addiction to smartphones [9, 4]. Smartphone addiction is defined as a state where the excessive use of a smartphone, the withdrawal symptoms of feeling anxious and nervous when without the smartphone, and higher tolerance that causes increased use to obtain the same level of satisfaction are observed. Although these symptoms negatively affect the daily life of the person, he/she cannot control the use of the smartphone (National Information Society Agency, 2011). Based on these characteristics, many researchers regard smartphone addiction as one of the behavioral addictions [10, 11, 12, 13].

Previous studies reported that excessive smartphone use by adolescents was associated with their gender, health problems, psychopathological state (depression, anxiety, high stress, low mood, etc.), and behavioral problems [8, 9, 14, 15, 16, 17]. This is because adolescents are easily affected by external stimuli, interpersonal problems, and emotional changes [3]. In addition, excessive smartphone use by adolescents can affect conflict with their parents, low academic achievement, and low satisfaction with life, leading to failure in performing developmental tasks and difficulties in adaptation [18, 19]. The focus of previous studies related to smartphone addiction has been on the characteristics of people who use smartphones excessively. These studies have been conducted to investigate smartphone users' addictive use of these devices, its side effects, and factors influencing smartphone addiction [20, 21, 22, 23]. However, despite the fact that smartphones are used for various purposes, there have only been a few studies on the relationship between usage types available with smartphones and smartphone addiction [4, 17, 24, 25, 26].

Smartphone usage types are categorized into playing games, social media use, news reading, entertainment (music/videos), exchanging text messages, making and receiving calls, commercial transaction, and location-based service [17, 25, 27, 28, 29]. In fact, most of the preceding studies have been carried out on the relationship between smartphone use for the purposes of playing games and social media use and smartphone addiction. Recent studies have presented analyses on the relationship between the profile of the smart device usage pattern and the risk of addiction or the assessment of the relationships among the usage type, the user's psychological characteristics, and addiction tendency [3, 20]. This study aimed at examining the effects of smartphone usage types on smartphone addiction based on the smartphone usage-type classification by Jeong et al. (2016).

This study also intended to verify whether the smartphone usage types could serve as the predictors of smartphone addiction even when the major variables found to predict smartphone addiction in previous studies conducted on adolescents were controlled.

The National Information Society Agency (2016) suggested four factors, including personal psychological factors, family environment factors, social environment factors, and technical factors, as the criteria for the classification of smartphone addiction. For this study, the main variables influencing smartphone addiction in adolescents were selected based on these criteria. The factors

that affect smartphone overdependence are as follows: loneliness, low self-esteem, anxiety, depression, and impulsiveness among personal psychological factors; low trust between parents and children, the parenting attitude of the parents, and the parents' overdependence on the smartphone among family environment factors; extremely high stress due to worries about college entrance and employment among social environment factors; and intrinsic technical attributes of smartphones such as portability and convenience of use among technical factors [30].

Of the personal psychological factors, depression was selected [31, 32, 33, 34, 35, 36]. Depression is closely related to media addiction [37]. Kim et al. (2015) reported that depression is the most important factor influencing smartphone addiction, and the higher an individual's tendency to be depressed, the more he uses the smartphone as a way to resolve internalized conflicts.

In the case of ADHD, a domestic study reported smartphone addiction in 40.0% of ADHD patients, and children with ADHD were found to use smartphones more often as a compensatory behavior for their low self-esteem, which means that they are exposed to the higher risk of being addicted to smartphones [36].

The parenting attitude of parents [38, 39, 40] was selected among the family environment factors. Among the various variables that affect adolescents' smartphone addiction, those related to family issues were found to have the greatest influence [41]. This is because the parenting attitude of parents has a great influence on adolescents whose independence as adults is delayed [42]. Another reason is that parents' understanding and cooperation are essential in solving the problem of adolescents' smartphone addiction.

Of the social environment factors, interpersonal problems [43, 44] and stress [45, 46] were selected. Recent studies have reported that interpersonal problems have a positive effect on smartphone addiction [47, 48]. This is because adolescence is an important period in which one prepares for adulthood by developing a healthy self-concept and acquiring various social skills [49].

With regard to stress, it was found that smartphones were considered and preferred as a cyberspace that allows adolescents to relieve their stress, providing anonymity, and easy entry and exit [50]. According to some studies, teenagers become engrossed in smartphone use to avoid psychological conflicts and worries or to forget difficulties in stressful situations [46].

This study, therefore, aims at examining the relationship between adolescents' smartphone usage types and smartphone addiction and the effect of the usage types on addiction when major predictors of smartphone addiction are controlled.

2. Materials and Methods

Study Subjects and Process

This study surveyed a total of 487 middle school students of which 234 were males and 253 females in a region after requesting cooperation from the middle school. Data analysis was performed using the SPSS 15.0 program, and the predictors of smartphone addiction were examined using correlation analysis and hierarchical multiple regression analysis.

Ethics statement

The subjects provided written informed consent. All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Dankook University Hospital.

Measurement Instruments

1. Smartphone Addiction Scale

A youth smartphone addiction self-diagnosis scale developed by the National Information Society Agency (2011) was used in this study. The total of 15 items of this scale are divided into four sub-factor categories as follows: 5 items on daily life disorders regarding difficulties in daily life due to excessive smartphone use; 2 items on the pursuit of the virtual world regarding a tendency to cling to the virtual world as it provides more enjoyment than the real world; 4 items on withdraw symptoms of anxiety and nervousness when not using the smartphone; and 4 items on higher tolerance that causes increased use for a sense of satisfaction. The items were constructed based on a 4-point Likert scale.

If a subjects gains a total score of 45 points or more, or meets all the conditions including 16 points or more in daily life disorders, 13 points or more in withdrawal symptoms, or 14 points or more in tolerance, the person is classified as a high-risk user. Subjects who obtain a total score of 42 points or more to 44 points or less, or satisfy any of the following conditions—14 points or more in daily life disorders, 12 points or more in withdrawal symptoms, and 13 points or more in tolerance—they are classified as potential risk users, while the rest are classified as general users. The overall scale reliability Cronbach’s α value reported by the developers was .88, and Cronbach’s α in this study was .89.

2. Smartphone Usage Type Scale

The smartphone usage type scale used in the study by Jeong et al. (2016) was used after the researcher modified it to reflect the characteristics of the subjects and supplemented it with more types. While the existing study divided smartphone usage types into 1) study, 2) entertainment (music/videos), 3) social media use (focused on conversation and social interaction), and 4) games, for this study, the researcher added the following three types based on preceding studies [17, 25, 27, 28, 29]: voice calls and text messages which are the most basic functions of the smartphone, information search, and other (shopping, schedule management, alarms, public transportation use, etc.). In the case of social media use, while some platforms such as YouTube and Facebook also include the use of music and video contents, such was defined as the use of social media for the purposes of conversation and social interaction as in the existing study [17]. The instruction “Some items regarding the purposes of app (e.g. Facebook) use may be confusing as the stated purposes can also be considered its functions, but choose an answer that best reflects your main purpose for app use” was added to the questionnaire, so that the study subjects can distinguish their social media use types. Therefore, this scale was finally constructed with the following seven usage types: 1) calls and text messages 2) study 3) information search 4) music/videos 5) social media use 6) games 7) other (shopping, schedule management, alarms, public transportation, etc.). Each item was structured on a 5-point Likert scale from “never use” to “use very often” to assess smartphone usage types.

3. Depression Scale

The Korean version of the Patient Health Questionnaire-9 (PHQ-9) developed by Kroenke, Spitzer, and Williams (2001), which was standardized by Ahn et al. (2013) was used as a tool to provisionally diagnose depression. PHQ-9 is a self-report test designed to diagnose depression in a simple way and assess the severity of the depression. The grades of depression indicated by each score range are as follows: “not depressive” by a score of 0-4 points; “mild depression” by a score of 5-9 points; “moderate depression” by a score of 10-14 points; “more than moderate depression” by a score of 15-19 points; and “severe depression” by a score of 20 points or more, which is a level where treatment by a psychiatrist is required. Cronbach’s α was .89 in the study by Kroenke, Spitzer, and Williams (2001), .95 in the domestic standardization study (Ahn et al., 2013), and .87 in this study.

4. ADHD Scale

The Korean version of the Attention-Deficit Hyperactivity Disorder Rating Scale (K-ARS), which is a behavioral assessment scale for children developed by DuPaul, was standardized for use in Korea by Kim et al. (2003). Designed to assess ADHD symptoms in school-age children, the scale has a high discriminant validity for discriminating between the ADHD patient group and the control group. Consisting of 18 questions, it is an efficient tool in distinguishing the three subtypes of ADHD (primarily inattentive, primarily hyperactive/impulsive, and combined). Cronbach's α was .90 in the study by DuPaul et al. (1997), from .77 to .89 in the study by Kim et al. (2003), and .92 in this study.

5. Parenting Attitude Scale

The parenting attitude scale devised by Heo (1999) and modified by panel researchers with expertise in youth issues was used in this study (National Youth Policy Institute, 2017). The original scale was composed of the sub-factors of the supervision, affection, inconsistency, excessive expectations, excessive interference, and rational explanation of parents. In this study, these sub-factors were divided into positive parenting attitude (supervision, affection, and rational explanation) and negative parenting attitude (inconsistency, excessive expectations, and excessive interference). In the study by Heo (1999), the Cronbach's α values for each factor ranged from .68 to .86. In this study, the Cronbach's α value for the 10 items related to the three sub-factors of positive parenting attitude was .88, and that of the 11 items related to the three sub-factors of negative parenting attitude was .87.

6. Stress Scale

The Perceived Stress Scale (PSS) developed by Cohen, Kamarck, and Mermelstein (1983) and validated by Park and Seo (2010) for use in Korea was selected to measure stress. PSS consists of 10 items that were constructed on a 5-point Likert scale with a score range from 10 to 50 points. The higher the score is, the higher the perceived stress level. The reliability Cronbach's α value of the original tool was .75 and the Cronbach's α values for negative and positive perceptions were .77 and .74, respectively, in the study by Park and Seo. In this study, Cronbach's α was .81.

7. Interpersonal Problem Scale

The short form of the Korean-Inventory of Interpersonal Problems Circumplex Scale (KIIP-SC) developed by Hong et al. (2002) was used in this study. The scale is composed of a total of 40 items and 8 sub-factors including a circumplex of personality, such as domineering, egocentric, cold, socially avoidant, nonassertive, overly-nurturing, self-sacrificing, and intrusive, with 5 questions for each subfactor. This scale is based on a 5-point Likert scale, and the higher the score is, the more serious the interpersonal problem. In the study by Hong et al. (2002), Cronbach's α was found to range from .61 to .81, and that in this study was ranged from .78 to .89.

3. Results

1. Demographic Characteristics of the Study Subjects

The final study subjects were 487 middle school students, of which 234 (48%) were male students and 253 (52%) were female students. Among the total students, 264 students (54.2%) were in the first grade, 113 (23.2%) in the second grade, and 110 (22.6%) in the third grade. Depending on the family financial status, 55 of the total students were classified into the high-level group (11.3%), 418 into the mid-level group (85.8%), and 14 into the low-level group (2.9%) [Table 1].

Table 1. Epidemiological Charateristics of Study Subjects

		Frequencies (%)
Gender	male	234(48.0%)

Grade	female	253(52.0%)
	First grade	264(54.2%)
	Second grade	113(23.2%)
	Third grade	110(22.6%)
SES	Upper	55(11.3%)
	Middle	418(85.8%)
	Lower	14(2.9%)
Total	487	

2. Correlation between Smartphone Addiction and Related Variables

Table 2 shows the correlation between smartphone addiction and gender, grade, financial status, smartphone usage type, depression, ADHD, positive parenting attitude, negative parenting attitude, stress, and interpersonal problem. Smartphone addiction was found to have a significant positive correlation ($r=.09-.39$, $p<0.5$) with all variables except for financial status and the three usage types including calls/text messages, information search, and games among the variables used in the study. The research also found a negative correlation ($r=-.11-.21$, $p<0.5$) between smartphone addiction and the two variables, study and positive parenting attitude) [Table 2].

Table 2. Correlation between Smartphone Addiction and Related Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1																	
2	.205**																
3	.089*	-.025															
4	.022	.059	.110*														
5	.041	.161**	-.071	.000													
6	-.114*	.117**	.050	.008	.226**												
7	-.052	-.053	.054	-.030	.166**	.246**											
8	.214**	.096*	-.027	-.017	.266**	-.034	.131**										
9	.199**	.217**	-.003	-.002	.366**	.080	.065	.380**									
10	.088	-.265**	-.052	-.087	.035	-.141**	.030	.102*	.014								
11	.123**	.109*	.092*	-.014	.225**	.156**	.306**	.127**	.266**	.098*							
12	.284**	.192**	.090*	.095*	.035	-.039	-.082	.039	.017	-.062	.136**						
13	.302**	.008	.105*	.040	-.040	-.044	-.067	.025	.034	.054	.103*	.488**					
14	-.207**	-.032	-.053	-.139**	.142**	.099*	.127**	.013	.065	.059	.000	-.300**	-.183**				
15	.220**	-.096*	-.022	.015	-.002	-.064	-.037	.008	-.010	.050	.055	.259**	.250**	-.426**			
16	.360**	.211**	.100*	.084	.051	-.022	-.078	.118**	.120**	-.023	.009	.374**	.316**	-.255**	.241**		
17	.386**	.15**	.076	.130**	-.121**	-.024	-.061	.029	-.084	.063	-.017	.505**	.506**	-.352**	.323**	.466**	
m	31.59	1.52	13.72	1.92	3.83	2.37	3.23	4.50	4.06	3.27	2.96	5.62	10.68	31.45	24.17	26.96	86.43
sd	7.43	0.50	0.89	0.37	1.01	0.91	1.07	0.80	1.18	1.30	1.13	5.05	9.90	5.36	6.82	6.58	26.93

1. Smartphone addiction, 2. Gender, 3. Grade, 4. SES (Socio Economic Status), 5. Call, Text message, 6. Study, 7. Information Finding, 8. Music/Movie, 9. SNS, 10. Game, 11. Etc.(Shopping etc.), 12. Depression, 13. ADHD, 14. Positive Parenting Attitude, 15. Negative Parenting Attitude, 16. Stress, 17. Interpersonal Relationship Problems

3. Multiple Regression Analysis among Variables Influencing Smartphone Addiction

A hierarchical multiple regression analysis was performed to determine whether smartphone usage types have a significant additional explanatory power for smartphone addiction [Table 3].

	Independent Variables	Model 1			Model 2			Model 3		
		β	SE	t	β	SE	t	β	SE	t
Epidemiological Variables	Constant		2.033	12.552***		3.745	4.747***		3.998	2.740**
	Gender	.207	0.660	4.656***	.149	0.633	3.500***	.140	0.661	3.140**
	Grade	.093	0.405	2.089*	.053	0.371	1.288	.063	0.362	1.574
	SES	-.001	0.904	-.011	-.042	0.830	-1.024	-.033	0.803	-.835
	Depression				.008	0.075	.165	.004	0.073	.074
Individual, social Variables	ADHD				.119	0.037	2.388*	.093	0.036	1.911
	Positive Parenting				-.036	0.065	-.777	-.042	0.064	-.918
	Negative Parenting				.090	0.051	1.925	.078	0.049	1.722
	Stress				.172	0.053	3.640***	.138	0.052	2.985**
	Interpersonal Relationship				.177	0.015	3.283***	.207	0.015	3.806***
Smartphone Usage type	Call, Text Message							-.014	0.329	-.303
	Study							-.107	0.342	-2.538*
	Information Finding							-.027	0.298	-.633
	Music, Movie							.118	0.403	2.728**
	SNS							.122	0.291	2.660**
	Game							.076	0.241	1.802
	Rtc. (Shopping etc.)							.062	0.291	1.403
F			8.596***			15.843***			12.294***	
R2			.051			.230			.295	
ΔR^2			.051			.179			.065	

Dependent Variable: Smartphone Addiction

Model 1 measured the influence of demographic variables (gender, grade, financial status) on smartphone addiction. Model 2 comprised the variables of depression, ADHD, positive and negative parental attitudes, stress, and interpersonal problems in addition to the three demographic variables of Model 1 and assessed the influence on smartphone addiction of these variables. Model 3, with the addition of smartphone usage types to Model 2, measured their influence on smartphone addiction.

First, in Model 1, into which demographic variables were measured, it was found that the gender ($\beta=.207$) and grade ($\beta=.093$) had a statistically significant effect on smartphone addiction ($F=8.596$, $p<.001$). In Model 2, depression, ADHD, positive and negative parenting attitudes of parents, stress, and interpersonal problems were added to the demographic variables of Model 1, and the gender ($\beta=.140$), ADHD ($\beta=.119$), stress ($\beta=.172$), and interpersonal problems ($\beta=.177$) showed a positively significant effect ($F=15.843$, $p<.001$). The explanatory power of Model 2 was 23%, which was 17.9% higher than that of Model 1. The grade ($\beta=.053$), which was significant in Model 1, was excluded from Model 2.

Finally, in Model 3, smartphone usage type was added to the variables of Model 2 ($F=12.294$, $p<.001$). The gender ($\beta=.140$), stress ($\beta=.138$), interpersonal problems ($\beta=.207$), and the usage type of study ($\beta=-.107$) had a negatively significant effect, while the usage type of music/videos ($\beta=.118$) and the usage type of social media use ($\beta=.122$) were found to have a positively significant effect. The explanatory power of Model 3 was 29.5%, which was 6.5% higher than that of Model 2. ADHD ($\beta=.093$), which was significant in Model 2, was excluded from Model 3. The results suggest that the level of smartphone addiction is higher among girls, and with the following: higher stress, more serious interpersonal problems, less use of the smartphone for study, more time spent enjoying music and videos, and more use of social media.

4. Discussion and conclusion

This study investigated the relationship between user characteristics, personal psychological factors, home and social environment characteristics, and smartphone usage types that can serve as the predictors of the individual's smartphone addiction. The results showed that in female students, interpersonal problems and stress were positively associated with smartphone addiction. In terms of smartphone usage types, music/videos and social media use had a positive relationship with

smartphone addiction, while the usage type study showed a negative relationship. Additionally, the contents that affect smartphone addiction were identified as music/videos, social media, and study, in descending order. On the other hand, games did not show any relationship with smartphone addiction in adolescents, contrary to the results of previous studies.

Similar to the results of previous studies on smartphone addiction and the gender [8, 15, 51], this study found that female students are more likely to be addicted to smartphones. Lin and Chiang (2017) saw that young female use smartphones to communicate, maintain relationships, achieve socialization, and find information and entertainment. Moreover, female users have a strong emotional attachment to these devices and can become dependent on them [15]. In addition, women are under higher stress regarding the maintenance of social relationships than men, and such stress is more likely to lead to habitual and addictive smartphone-related behaviors [8].

In line with the findings of previous studies on smartphone addiction and interpersonal problems [47, 48, 52], the presence of interpersonal problems was found to affect smartphone addiction in this study. A preceding study has reported that students who are isolated and evasive in relationships with others show a compulsive addiction to smartphones. Those who are cold and closed in interpersonal relationships have a higher tendency to be addicted to smartphones [53]. In addition, those with a higher level of social discomfort, a lower level of social problem-solving ability, and more interpersonal problems have been found to have a higher tendency to develop Internet addiction [54].

Consistent with the results of previous studies on smartphone addiction and stress [17, 46], this study found that the higher the stress is, the greater its influence on smartphone addiction. When adolescents face stress, they choose passive and superficial solutions rather than actively seeking solutions to the problems, and prefer cyberspaces with guaranteed anonymity and easy access as a space for releasing their stress [42].

On the other hand, depression, ADHD, and parenting attitude of parents showed a significant relationship with smartphone addiction. However, these correlations were not observed in regression analysis. This suggests that interpersonal problems and stress can be stronger predictors of smartphone addiction than depression, ADHD, and parenting attitudes.

Among the smartphone usage types, social media use and music/videos positively predicted smartphone addiction. This result is consistent with previous research findings that the use of social media is a predictor of smartphone addiction [4, 17, 25, 26, 55], while showing that enjoying music/videos is also a positive predictor of smartphone addiction [17, 29].

This study classified smartphone usage types into social media use and music/video. In the case of YouTube and Facebook, however, these platforms have combined the function related to the formation of social relationships, which is intrinsic to social media and other various functions related to music/videos. Since the two factors that influence smartphone addiction are combined in a complex manner in the two platforms, further exploration of their influence is needed.

The smartphone usage type study was found to have a negative effect on smartphone addiction. This is consistent with the results of a previous study that smartphone applications intended for user convenience such as educational programs/dictionaries have a negative effect on smartphone addiction [28]. This suggests that training students on how to use smartphone contents in a balanced way through an educational approach can be helpful in preventing smartphone addiction in the future.

On the other hand, the results of this study on the relationship between smartphone addiction and games were not consistent with the results of previous studies that games had a positive effect on smartphone addiction [4, 17]. Lee et al. (2017) [10] reported that the smartphone usage types differ according to the age and gender. The subjects of this study were middle school students, while the subjects of the previous studies [4, 17] were elementary school students in the 4th to 6th grades.

According to the smartphone application use rates in 2018, the use rate of game apps (38.3%) was the highest in elementary school higher graders, followed by the use rate of instant messenger apps (17.9%). In contrast, the most frequently used apps by middle school students were instant messenger apps (24.3%), followed by game apps (20.1%). These results suggest that smartphone usage patterns differ depending on the grade (National Information Society Agency, 2020).

Higher graders of elementary school are in the stage of “industry vs. inferiority” according to Erikson’s psychological development theory, and experiencing a sense of accomplishment by making efforts has an important influence on them. As many of the smartphone games are designed for single players rather than for group players, it seems that smartphone games stimulate a sense of accomplishment in higher graders of elementary school, engrossing them in these games.

On the other hand, as middle school students are in a stage of “identity vs. role confusion” that characterizes adolescence, peer relationships are very important to them. Therefore, they seek to be part of a community where they can share culture and play together with their peers rather than engaging in smartphone games that are relatively more focused on single play. Therefore, it is considered that computer games in PC cafes where they can interact with their peer community are more preferred by adolescents to smartphone games. This suggests that research on which platform each age group mainly plays games in relation to their developmental age is also necessary.

The limitations of this study are as follows. First, the subjects of this study were confined to middle school students in an area of ChungBuk Province. There can be differences in students’ smartphone addiction levels according to regions, and smartphone addiction levels and usage types in one area cannot represent those in the entire region. While this study was conducted on middle school students who are younger adolescents, there may be differences in smartphone usage types and levels depending on the developmental stage and adaptation levels of adolescents. In particular, high school students who are preparing for the college entrance exam may have different smartphone experiences from those of middle school students. Therefore, it will be necessary to consider the regional differences among study subjects and to extend the age range of the subjects in future studies.

Second, this study classified smartphone usage types based on previous studies comparing smartphone use types. The classification was specially made by supplementing the types presented in the study by Jeong et al. (2016). However, this approach exposed limits in classifying the various functions of smartphones simply by types. In addition, there are also limits in terms of how the study subjects’ smartphone usage types are determined. That is, related items that are relatively simple and the evaluation of use frequency of each type based on a Likert scale suggest that the validity of this approach can be weak. In the future, it will be necessary to develop a more elaborate scale to classify the types of smartphone usage.

Third, since the measurement was carried out with the study subjects’ responses based on their personal perception by using a self-report questionnaire, the respondents’ subjective interpretations may be included in the survey results. Therefore, there are limits in generalizing the results of this study, and follow-up studies that investigate the perspectives of parents and teachers are needed.

Despite these limitations, this study is significant in that it provides basic data for the study on smartphone addiction and usage types, where few studies have been carried out on these topics. Particularly with the rapid spread of smartphones, while studies on smartphone use and addiction have been actively conducted, there have been relatively fewer studies on content related to the unique functions of smartphones, that is, smartphone applications that correspond to usage types. This study focused on the types of smartphone usage and examined the relationship between these types and smartphone addiction, to verify that there are significant differences in the levels of smartphone addiction according to these smartphone usage types when the variables predicting smartphone addiction are controlled. This suggests that selective intervention according to the main smartphone usage type can be effective in preventing addiction. Accordingly, there is a need for further studies on the relationship between smartphone usage types and smartphone addiction.

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