

한국 청소년의 외로움과 우울 증상이 스마트폰 과의존에 미치는 영향

이재영

경성대학교 간호학과

Effect of Loneliness and Depressive Symptoms on Smartphone Overdependence among South Korean Adolescents: A Nationwide Cross-Sectional Study

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Background: This study utilized data from the Korea Youth Risk Behavior Survey to determine the impact of depressive symptoms and loneliness on smartphone overdependence among South Korean adolescents.

Methods: This study performed a secondary analysis of cross-sectional data from the 16th Korea Youth Risk Behavior Survey (2020). Data (n=57,925 adolescents aged 12-18 years) were collected from August to November 2020 during the coronavirus disease-2019 (COVID-19) pandemic. The relationships between depressive symptoms, loneliness, and smartphone overdependence were analyzed using complex sample multiple logistic regression analyses.

Results: One-quarter of adolescents had developed smartphone overdependence (30.0% of girls and 21.2% of boys). Smartphone overdependence was influenced by depressive symptoms and loneliness, regardless of sex.

Conclusions: Appropriate interventions and policies should be developed to resolve smartphone overdependence by reducing adolescents' depressive symptoms and loneliness. Appropriate help should be provided to these adolescents to promote good mental health. Psychological vulnerability should be considered when providing educational or health management programs to adolescents. Appropriate measures should be developed for the prevention and early screening of depressive symptoms, loneliness, and smartphone overdependence in adolescents, with increased interest in minimizing the related social problems.

Korean J Health Promot 2022;22(1):1-9

Keywords: Adolescent, Depression, Loneliness, Smartphone addiction, COVID-19

INTRODUCTION

1. Background

According to the 2018 Global Attitudes Survey, in line with the rapid distribution of mobile technology worldwide, over 5 billion individuals possess a mobile device at present, while smartphone ownership in South Korea is ranked at

■ Received: Dec. 31, 2021 ■ Revised: Jan. 14, 2022 ■ Accepted: Feb. 9, 2022

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■ This research was supported by Kyung Sung University Research Grants in 2020.

the top.¹⁾ The Korea Information Society Development Institute reported that the rate of smartphone possession among middle and high school students in South Korea has steadily increased to 95.9% and 95.2%, respectively, in 2019, with figures substantially higher than the mean percentage of all age groups (87.2%).²⁾

Smartphones are daily communication devices and tools demanded by the social community, business, and education;³⁾ however, excessive use poses problems. Adolescents use smartphones more frequently than adults, and they display excessive use through phone conversations, games, and the internet,⁴⁾ as well as social networking services (SNS) and online chats,⁵⁾ which could easily lead to problems such as addiction.⁴⁾

Smartphone overdependence refers to problems caused by reduced self-control owing to excessive smartphone use.⁶⁾ Self-control failure is the reduced ability to voluntarily control smartphone use in accordance with the subjective goals of the user; salience is when the habitual use of smartphones becomes the most prominent and important activity in an individual's life compared to other activities; and serious consequences occur through the continuous use of smartphones despite experiencing negative physical, psychological, and social consequences.⁷⁾ Clearly, smartphone overdependence exerts a negative effect on users' physical and psychological health.⁴⁾

The mean time of smartphone use by individuals in South Korea was 1 hour 53 minutes for all age groups, but 2 hours 24 minutes for middle-schoolers and 2 hours 15 minutes for high-school students.²⁾ The excessive smartphone use could have a particularly negative effect on adolescents.³⁾ Further, problematic smartphone use has rapidly increased among adolescents,⁸⁾ which has widespread side effects.⁹⁾ Thus, the South Korean government has been providing preventive and rehabilitation programs for adolescent internet addiction since 2005.¹⁰⁾ In addition, the Ministry of Gender Equality and Family in South Korea, an institution responsible for adolescent policies, founded the first protective and treatment facility for problematic smartphone use in adolescents in 2014. In 2018 alone, the counseling center was visited by some 40,000 teens experiencing smartphone overdependence.¹⁰⁾

The current status of information dysfunction caused by the problematic use of smartphones should be analyzed objectively to clarify smartphone overdependence. It is also important to develop effective policies and measures to pre-

vent and alleviate smartphone overdependence, and all age groups should be separately investigated.⁷⁾ For the adolescent population, an understanding of their smartphone use is necessary considering the vast personal and social problems that come with excessive smartphone use.¹¹⁾ However, there is still a general lack of studies regarding smartphone overdependence in adolescents and users' psychological health,⁸⁾ and an investigation of smartphone overdependence requires a multidimensional perspective.¹²⁾

In recent years, research has focused on identifying factors related to the excessive use of smartphones.¹¹⁾ The potential influencing factors identified in previous studies include stress, depression, anxiety, loneliness, shyness, and so on.¹¹⁾ When the psychological factors that influence excessive smartphone use in adolescents were identified, emotional components such as depression showed a significant correlation with excessive smartphone use.⁹⁾ Depression has an influence on problematic-smartphone use,¹³⁾ and individuals with an unstable mental health (e.g., depression) are more likely to rely heavily on smartphone use than their healthier counterparts.¹¹⁾

A correlation was found between smartphone overdependence and loneliness,¹⁴⁾ and problems could arise as adolescents resort to the use of smartphones to escape self-perceived loneliness.¹⁵⁾ In 2020, the novel coronavirus disease-2019 (COVID-19) pandemic restricted social interactions, and students' classes were replaced with online classes in South Korea,¹⁶⁾ which was associated with increased loneliness.¹⁷⁾ The spread of COVID-19 has also led the government of South Korea to convert most of the classes nationwide to all-day Online-based classes during our period of investigation,¹⁶⁾ which further emphasizes the need to study the relationship between smartphone overdependence and psychological health during this time of physical and social restrictions. Thus, it is necessary that depressive symptoms and loneliness are simultaneously regarded as the cause of smartphone overdependence in adolescents. Furthermore, girls have shown a higher risk of smartphone addiction than boys,⁸⁾ and girls have shown a higher level of problematic smartphone use than boys;¹⁸⁾ therefore, it is necessary to conduct an investigation reflecting sex differences.

According to the Korea Disease Control and Prevention Agency (KDCA), in the Korea Youth Risk Behavior Survey (KYRBS), an in-depth analysis was necessary concerning the

field of internet addiction and mental health.¹⁹⁾ Thus, an additional analysis was conducted on the 16th KYRBS (2020). The Loneliness Experience Scale was used in the in-depth analysis of mental health, and a smartphone overdependence experience scale was used to analyze internet addiction. By applying the findings in these analyses, far more in-depth analyses of smartphone overdependence, depressive symptoms, and loneliness became possible, with the data made available to represent the entire adolescent population.

2. Research purpose

This study investigated the level of smartphone overdependence among South Korean adolescents during the COVID-19 pandemic by using the nationally representative data.¹²⁾ The effects of loneliness and depression on smartphone overdependence were considered.

METHODS

1. Research design

This study performed a secondary analysis of cross-sectional data from the 16th KYRBS.¹⁹⁾

2. Participants

The KYRBS is an anonymous, self-reported, online national survey about health behaviors among South Korean adolescents. The survey has been conducted annually since 2005 among both middle- and high-school students in South Korea. The KYRBS is a statistical survey approved by the government (No. 117058). The purpose of the survey was to calculate statistics on the health behavior of adolescents in South Korea, and the statistical data were used as basic data necessary for the planning and evaluation of adolescent health policies and health promotion programs.¹⁹⁾

The 16th KYRBS (2020) survey was conducted with 57,925 students from 400 middle schools and 400 high schools. A total of 54,948 students from 793 schools (398 middle schools and 395 high schools) were surveyed (response rate, 94.9%). Among the sample students, long-term absences, children with special needs who could not participate in the survey independently, and students with text reading disabilities were excluded. The data collection period was

from August to November 2020.¹⁹⁾

3. Measures

1) Smartphone overdependence

The smartphone overdependence scale developed by the National Information Society Agency (2016) was used.²⁰⁾ Smartphone overdependence was developed to measure smartphone overdependence among South Korean youth, adults, and seniors.⁷⁾ This tool was used in the 16th KYRBS (2020) survey and has been deemed credible.⁷⁾

The questionnaire comprises 10 items: three about “self-control failure,” three about “salience,” and four about “serious consequences.” Responses are based on a four-point scale: 1=“not at all” to 4=“very true.” The total scores ranged from 10 to 40. Scores exceeding 22 indicate smartphone overdependence in youth.⁷⁾ Cronbach’s α at the time of survey development²⁰⁾ was 0.84, and Cronbach’s α was 0.92 in the current study.

2) Loneliness symptoms

To answer to the question “How often have you felt lonely during the last 12 months?” Responses included “not feeling lonely at all,” “feeling a little lonely,” “sometimes feeling lonely,” “often feeling lonely,” and “always feeling lonely.” The presence of loneliness symptoms was reclassified as “lonely” (“often feeling lonely” and “always feeling lonely”) or “non-lonely” (“not feeling lonely at all,” “feeling a little lonely,” and “sometimes feeling lonely”).

3) Depressive symptoms

To answer to the question “Have you ever been sad or desperate enough to stop your daily activities during the last 12 months?” The presence of depressive symptoms was checked as “depressed” and “non-depressed.”

4) Covariates

Eleven covariates were included in the analysis, including socioeconomic status, problem behavior, and mental health variables.^{11,12,15,18)} (1) Socioeconomic variables were sex, age, perceived economic status (very high, high, middle, low, very low), perceived academic performance (very high, high, middle, low, very low), and body mass index (BMI; kg/m²). (2) Problem behavior variables were drug (yes or no), drinking (yes or no), and smoking (yes or no) experiences. And

(3) mental health variables were perceived stress (very high, high, middle, low, very low), sleep satisfaction (very satisfied, satisfied, neutral, dissatisfied, very dissatisfied enough), and suicidal ideation (yes, no).

4. Data collection and procedure

The target population for the 16th KYRBS (2020) was defined as national middle- and high-school students in South Korea as of April 2020.¹⁹⁾ The sampling frame for the sampling design used data from national middle and high schools as of April 2019. Stratified cluster sampling was used: the first unit was school and the second unit was class. The KYRBS is a nationwide cross-sectional survey approved by the South Korean government. The survey support teacher distributed one guide for each student and explained the necessity of the survey and how to participate. Participation was voluntary, and students participated in the survey by accessing the website with the participation number printed on the guide.¹⁹⁾

5. Data analysis

Data were analyzed using IBM SPSS version 25 (IBM Corp., Armonk, NY, USA). All raw data were provided by the KDCA, and the survey data were analyzed using complex sampling designs: 1) prevalence of smartphone overdependence, depressive symptoms, and loneliness symptoms were calculated for all participants, and girls and boys separately. 2) Associations between smartphone overdependence, depressive symptoms, and loneliness symptoms were examined with Rao-Scott chi-square tests. And 3) odds ratios for depressive and loneliness symptoms, according to the presence of smartphone overdependence, were calculated with complex sample multiple logistic regression analyses for all participants, and girls and boys separately. Model 1 consisted of an independent variable (smartphone overdependence) and dependent variables (depressive symptoms or loneliness symptoms). Model 2 consisted of an independent variable (smartphone overdependence), covariates, and dependent variables (depressive symptoms or loneliness symptoms). Each statistical model was calculated for all participants and girls and boys separately.

Table 1. Socioeconomic, problem behavior, and mental health characteristics in Korean adolescents (n=54,948)

Variable	Value
Socioeconomic characteristics	
Sex	
Male	28,353 (51.9)
Female	26,595 (48.1)
Age, y (n=54,809)	15.19±0.02
Perceived economic status	
Very high	6,039 (11.2)
High	15,300 (28.6)
Middle	26,397 (47.5)
Low	5,937 (10.4)
Very low	1,275 (2.2)
Perceived academic performance	
Very high	6,736 (12.2)
High	13,410 (24.6)
Middle	16,585 (30.1)
Low	12,684 (23.0)
Very low	5,533 (10.0)
Body mass index, kg/m ² (n=53,534)	21.50±0.03
Problem behavior characteristics	
Drug experiences	
No	54,543 (99.2)
Yes	405 (0.8)
Drinking experiences	
No	36,591 (66.6)
Yes	18,357 (33.4)
Smoking experiences	
No	49,318 (89.8)
Yes	5,630 (10.2)
Mental health characteristics	
Perceived stress	
Very low	2,018 (3.6)
Low	9,889 (17.8)
Middle	24,379 (44.5)
High	14,059 (25.9)
Very high	4,603 (8.3)
Sleep satisfaction	
Very satisfied	5,582 (9.9)
Satisfied	11,242 (20.4)
Neutral	18,656 (33.7)
Dissatisfied	13,481 (24.8)
Very dissatisfied enough	5,987 (11.2)
Suicidal ideation	
No	48,969 (89.1)
Yes	5,979 (10.9)

Values are presented as mean±standard error or number (weighted %).

6. Ethical considerations

This study was conducted after obtaining approval from the government agency website and downloading the data (<http://www.kdca.go.kr/yhs/>). In addition, it was exempted from deliberation by Kyungseong University's Institutional Review Board (No. KSU-21-05-001).

RESULTS

1. Socioeconomic, problem behavior, and mental health characteristics in Korean adolescents

The study included 51.9% males and 48.1% females, with a mean age of 15.19 years. As for perceived economic status, 47.5% respondents were at middle and 28.6% at high. In terms of perceived academic performance, 30.1% were middle. The BMI^a mean of the participants was 21.50. Drug experiences, drinking experiences, and smoking experiences

Table 2. Prevalence of smartphone overdependence depressive symptoms and loneliness symptoms in Korean adolescents (n=54,948)

Variable	All participants (n=54,948)	Female (n=26,595)	Male (n=28,353)
Smartphone overdependence			
Normal	41,173 (74.5); 15.88±0.03	18,652 (70.0); 16.53±0.04	22,521 (78.8); 15.35±0.03
Overdependence	13,775 (25.5); 26.56±0.03	7,943 (30.0); 26.64±0.04	5,832 (21.2); 26.45±0.05
Total	54,948 (100.0); 18.60±0.04	26,595 (100.0); 19.57±0.05	28,353 (100.0); 17.70±0.05
Depressive symptoms			
Depressed	13,840 (25.2)	8,207 (30.7)	5,633 (20.1)
Non-depressed	41,108 (74.8)	18,388 (69.3)	22,720 (79.9)
Loneliness symptoms			
Lonely	7,766 (14.1)	4,827 (18.0)	2,939 (10.5)
Non-lonely	47,182 (85.9)	21,768 (82.0)	25,414 (89.5)

Values are presented as mean±standard error or number (weighted %).

Table 3. Comparison of smartphone overdependence according to depressive symptoms and loneliness symptoms of Korean adolescents (n=54,948)

Variable	Smartphone overdependence								
	All participants (n=54,948)			Female (n=26,595)			Male (n=28,353)		
	Normal (n=41,173)	Overde- pendence (n=13,775)	χ^2 (P^a)	Normal (n=18,652)	Overde- pendence (n=7,943)	χ^2 (P^a)	Normal (n=22,521)	Overde- pendence (n=5,832)	χ^2 (P^a)
Depressive symptoms									
Depressed	8,926 (64.1)	4,914 (35.9)	1,011.36 (<0.001)	4,912 (59.7)	3,295 (40.3)	576.08 (<0.001)	4,014 (70.4)	1,619 (29.6)	282.53 (<0.001)
Non-depressed	32,247 (78.1)	8,861 (21.9)		13,740 (74.5)	4,648 (25.5)		18,507 (80.9)	4,213 (19.1)	
Loneliness symptoms									
Lonely	4,660 (59.4)	3,106 (40.6)	1,001.14 (<0.001)	2,683 (55.0)	2,144 (45.0)	592.51 (<0.001)	1,977 (66.6)	962 (33.4)	269.48 (<0.001)
Non-lonely	36,513 (77.0)	10,669 (23.0)		15,969 (73.3)	5,799 (26.7)		20,544 (80.2)	4,870 (19.8)	

Values are presented as number (weighted %).

^aRao-Scott chi-square test for complex sample.

were 0.8%, 33.4%, and 10.2%, respectively. As for perceived stress, 44.5% were middle. As for sleep satisfaction, 33.7% were neutral. 10.9% of the participants declared having had suicidal ideation (Table 1).

2. Smartphone overdependence, depressive symptoms, and loneliness symptoms

In total, 25.5% of the participants declared having had smartphone overdependence, including 30.0% of female participants and 21.2% of male participants. Of a total of 40 points, the mean scores for all participants, female participants, and male participants were 18.60, 19.57, and 17.70, respectively. Moreover, 25.2% of the participants declared having had depressive symptoms, including 30.7% of female participants and 20.1% of male participants. Further, 14.1% of the participants declared having had loneliness symptoms, including 18.0% of female participants and 10.5% of male participants (Table 2).

3. Comparison of smartphone overdependence according to depressive and loneliness symptoms

All participants showed differences in self-rated health according to depressive symptoms and loneliness symptoms ($P<0.001$). Among participants with smartphone overdependence, 35.9% had depressive symptoms and 21.9%

had no depressive symptoms ($P<0.001$). Among participants with smartphone overdependence, 40.6% had loneliness symptoms and 23.0% had no loneliness symptoms ($P<0.001$; Table 3).

4. Effect depressive and loneliness symptoms on smartphone overdependence

Odds ratios for depressive symptoms according to smartphone overdependence, controlling for covariates, are shown in Table 4. Among all participants, individuals who had experienced smartphone overdependence were 1.99 times (model 1) more likely to have had depressive symptoms compared to individuals who had not experienced smartphone overdependence ($P<0.001$). After controlling for covariates, the odds ratio decreased to 1.26 (model 2; $P<0.001$). Among female participants, students who displayed smartphone overdependence were 1.98 times (model 1) more likely to have had depressive symptoms compared to students who did not display smartphone overdependence ($P<0.001$). After controlling for covariates, the odds ratio decreased to 1.31 (model 2; $P<0.001$). Among male participants, students who displayed smartphone overdependence were 1.78 times (model 1) more likely to have had depressive symptoms compared to students who did not display smartphone overdependence ($P<0.001$). After controlling for covariates, the odds ratio decreased to 1.19 (model 2; $P<0.001$).

Table 4. Effect of depressive and loneliness symptoms on smartphone overdependence among Korean adolescents (n=54,948)

Variable	All participants (n=54,948)				Female (n=26,595)				Male (n=28,353)			
	Model 1 ^a		Model 2 ^b		Model 1 ^a		Model 2 ^c		Model 1 ^a		Model 2 ^c	
	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)
Depressive symptoms (ref.: non-depressed)												
Depressed	<0.001	1.99 (1.91- 2.08)	<0.001	1.26 (1.20- 1.33)	<0.001	1.98 (1.87- 2.09)	<0.001	1.31 (1.23- 1.40)	<0.001	1.78 (1.66- 1.91)	<0.001	1.19 (1.09- 1.30)
Loneliness symptoms (ref.: non-lonely)												
Lonely	<0.001	2.29 (2.17- 2.41)	<0.001	1.39 (1.30- 1.48)	<0.001	2.25 (2.11- 2.39)	<0.001	1.44 (1.34- 1.56)	<0.001	2.04 (1.88- 2.22)	<0.001	1.30 (1.17- 1.45)

Abbreviations: CI, confidence interval; OR, odds ratio; ref., reference.

^aComplex sample logistic regression analysis was used.

^bComplex sample multiple logistic regression analysis was used, controlling for 11 covariates.

^cComplex sample multiple logistic regression analysis was used, controlling for 10 covariates (excluding genders from 11).

Odds ratios for loneliness symptoms according to smartphone overdependence, controlling for covariates, are shown in Table 4. Among all participants, individuals who displayed smartphone overdependence were 2.29 times (model 1) more likely to have had loneliness symptoms compared to individuals who had not display smartphone overdependence ($P<0.001$). After controlling for covariates, the odds ratio decreased to 1.39 (model 2; $P<0.001$). Among female participants, students who displayed smartphone overdependence were 2.25 times (model 1) more likely to have had loneliness symptoms compared to students who did not display smartphone overdependence ($P<0.001$). After controlling for covariates, the odds ratio decreased to 1.44 (model 2; $P<0.001$). Among male participants, students who displayed smartphone overdependence were 2.04 times (model 1) more likely to have had loneliness symptoms compared to students who did not display smartphone overdependence ($P<0.001$). After controlling for covariates, the odds ratio decreased to 1.30 (model 2; $P<0.001$).

DISCUSSION

The findings suggested that depressive symptoms and loneliness had a significant impact on smartphone overdependence in adolescents in South Korea. Notably, the data in this study were collected from August to November 2020, during the global COVID-19 pandemic. At this time, South Korean adolescents mostly stayed home and had online classes in lieu of face-to-face classes.¹⁶⁾ Therefore, this study was conducted in circumstances that restricted social interactions, and the findings are thus considerably valuable. Further, to analyze sex differences, participants were divided into groups by sex. The results showed that, regardless of sex, significant associations were found for smartphone overdependence, depressive symptoms, and loneliness.

The data provide evidence to support the need for the management of smartphone overdependence in adolescents with depressive symptoms or loneliness. Consequently, adolescents with high levels of loneliness or depressive symptoms should be screened as early as possible so that they may be guided to perform healthier and more diverse activities to prevent problematic smartphone use. Therefore, further studies should be conducted considering various environmental factors.

In this study, one-quarter of the examined adolescents

displayed smartphone overdependence, and it was more common in girls than boys. Many previous studies also reported sex differences in problems related to smartphone use,^{13,18)} with more smartphone overdependence in girls than in boys.¹⁸⁾ This was also in line with a 2020 survey on smartphone overdependence in South Korea, which reported that girls were relatively more vulnerable to smartphone overdependence than boys.⁷⁾ This may be attributed to the higher probability of girls using their smartphones for peer communication via SNS, online chats, and internet browsing, whereas boys mostly use their smartphones for playing games.⁵⁾

A considerable advantage of this study is the use of a smartphone overdependence screening tool with high reliability as the tool was developed by a national institution in South Korea. The fact that the tool was developed primarily for use in South Korea prevents a ready comparison with other countries. As smartphone overdependence is a relatively new phenomenon, the comparison among different countries is difficult. Even in the USA, a well-established scale for smartphone overdependence has not yet been established.²¹⁾ In certain studies, the level of smartphone overdependence was measured based on the time of use to analyze the relationship with psychosocial variables;⁵⁾ however, the determination of smartphone overdependence or addiction solely based on increased time of use does not seem reliable. In the future, a standardized tool should be applied to compare the status of different countries with subsequent discussions.²¹⁾

In this study, smartphone overdependence in adolescents was correlated with depressive and loneliness symptoms, regardless of sex. The former result coincides with a previous study that found more depressive symptoms in adolescents with problematic smartphone use,¹⁸⁾ based on the same context in which depression was suggested as a predictor of problematic smartphone use.¹³⁾ The latter result coincides with numerous previous studies that reported that self-perceived loneliness in adolescents has a significant effect on smartphone addiction;^{4,15)} higher levels of loneliness lead to higher problematic smartphone use,³⁾ and an increase in smartphone dependency leads to an increase in loneliness.²²⁾ This result is thus indicative of how smartphones may be used to compensate for the lack of social interactions¹⁷⁾ and how loneliness may influence smartphone overdependence. Adolescents who perceive a high level of loneliness resort

to the use of smartphones to overcome loneliness, which unintentionally causes daily problems; thus, the preference for the virtual reality experienced through smartphone use increases.¹⁵⁾ One way to solve the problem of smartphone overdependence may be to reduce loneliness in adolescents by providing activities in which they participate in social interactions.^{14,17)}

With the rapid distribution of smartphones in South Korea, the problem of social maladaptation caused by smartphone use has become a widespread social issue.^{2,11)} The problematic behaviors related to smartphone use are not being addicted to the device itself, but rather being addicted to the content that they provide.¹⁰⁾ For adolescents, however, smartphone use is a means of communication and a crucial source of information; thus, it is extremely difficult to prevent their use altogether. To minimize the problems related to smartphone use, it is necessary to provide an environment for adolescents to reduce their levels of loneliness and depression. Effective social support and psychological guidance are likely to help adolescents use their smartphones in more reasonable and appropriate ways. Problematic smartphone use is also predicted to decrease through the promotion of the healthy use of SNS and positive social relationships.¹³⁾ In the future, suitable social interventions and measures should be developed and applied to prevent smartphone addiction among adolescents.

Practitioners providing care for adolescents should consider the following. Firstly, with the understanding of the impact of depressive symptoms and loneliness on smartphone overdependence in adolescents, appropriate help should be provided to maintain good mental health. Practitioners should discuss smartphone use with adolescents to help clarify the relationships among smartphone use, dependence, and psychological health. Secondly, cellular phone distraction reduction application²³⁾ may be recommended to adolescents for them to manage their smartphone usage more effectively.

This study had a few limitations that inform future researchers. Firstly, this study presents results obtained during the special circumstances of the COVID-19 pandemic. Thus, the results should be compared with the future trends of changes concerning smartphone overdependence, depressive symptoms, and loneliness after the COVID-19 pandemic. Secondly, several relevant factors that were examined previously were not included in this study (e.g., shy-

ness,¹¹⁾ self-esteem,²²⁾ and interpersonal relationships¹⁸⁾). Future researchers may wish to elaborate on these prior findings. Thirdly, the levels of depressive symptoms and loneliness were measured through students' self-reported responses; thus, there is a possibility of under- or over-estimation owing to the lack of objective indicators. Notably, participants completed a measure of depression using a short-term timeframe. In future studies, depressive symptoms and loneliness should be measured more objectively, while their severity should also be analyzed.

The unique significance of this study lies in the fact that it was conducted in a situation where the global COVID-19 pandemic persists to restrict social interactions. One-quarter of adolescents displayed smartphone overdependence, which was more common in girls than boys. Students' smartphone overdependence was influenced by depressive symptoms and loneliness, regardless of sex. Consequently, appropriate interventions and policies should be developed to resolve the problem of smartphone overdependence through the reduction of adolescents' depressive and loneliness symptoms.

요 약

연구배경: 본 연구는 청소년건강행태조사 자료를 활용하여 한국 청소년의 우울 증상과 외로움이 스마트폰 과의존에 미치는 영향을 파악하였다.

방법: 본 연구는 제16차 청소년건강행태조사(2020) 결과를 이차 분석하였다. 연구 대상자는 12-18세 청소년 57,925명이었으며, 코로나바이러스감염증-19가 만연하는 기간인 2020년 8-11월에 수집되었다. 우울 증상, 외로움, 스마트폰 과의존 간의 관계는 복합표본 다중 로지스틱 회귀분석을 사용하여 분석하였다.

결과: 한국 청소년의 25%가 스마트폰 과의존을 경험하였으며, 여자 청소년은 30.0%, 남자 청소년은 21.2%였다. 스마트폰 과의존은 성별에 관계없이 우울 증상과 외로움에 영향을 받았다.

결론: 청소년의 우울 증상과 외로움을 감소시켜 스마트폰 과의존을 해결하기 위한 적절한 개입과 정책이 개발되어야 한다. 또한, 청소년의 우울 증상, 외로움, 스마트폰 과의존 등의 예방 및 조기 검진을 위한 적절한 조치가 개발되어야 하며, 이와 관련된 문제를 최소화하는 데 사회적 관심이 요구된다.

중심 단어: 청소년, 우울, 외로움, 스마트폰 과의존, 코로나 바이러스감염증-19

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