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# Psychological Factors associated with Smartphone Addiction in Young Adolescents

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Major in Medicine

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A Dissertation Submitted to The Graduate School of
Ajou University in Partial Fulfillment of the Requirements
for the Degree of Ph.D. in Medicine

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**This certifies that the dissertation**

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- ABSTRACT-

# Psychological factors associated with Smartphone Addiction in Young Adolescents

The smartphone has many attractive attributes and characteristics that make it highly addictive, particularly in adolescents. The purpose of this study was to examine the prevalence of young adolescents in risk of smartphone addiction and the psychological factors associated with smartphone addiction. 490 middle-school students completed a self-questionnaire measuring levels of smartphone addiction, behavioral and emotional problems, self-esteem, anxiety, and adolescent-parent communication. 128(26.61%) adolescents were in high risk of smartphone addiction. Adolescents in high risk of smartphone addiction showed significantly more severe levels of behavioral and emotional problems, lower self-esteem and poorer quality of communication with their parents. Multiple regression analysis revealed that the severity of smartphone addiction was associated with aggressive behavior($\beta$=0.593, t=3.825) and self-esteem($\beta$=-0.305, t=-2.258). Further exploratory and confirmatory studies should consider different sites, demographics, technological mobile devices, platforms, and applications.

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Keywords: adolescent, smartphone addiction, psychological factor, self-esteem, aggressive behavior

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# I. INTRODUCTION

Internet addiction or problematic internet use has been the focus of attention for several years. Although not yet recognized as an established disorder, it is known that internet addiction has become a serious public health problem around the world, especially in adolescents (Christakis, 2010). Previous studies suggested that internet addiction increased the risk to suffer from a number of negative social and health consequences, such as poor academic performance, poor personality relationship, anxiety, depression, and other behavioral problems (Aboujaoude, 2010; Yang & Tung, 2007). However, with the rapid evolving development of technology, internet addiction doesn't seem to be the only, neither the most serious cause of concern.

Most recently, smartphone addiction has been proposed as a diagnostic label to capture problems related to the drastic increase in use of smartphones. A smartphone is a relatively novel and innovative technology which typically combines the features of a mobile phone with those of other popular mobile devices, such as personal digital assistant, media player, GPS navigation unit, and etc.. A smartphone enables ubiquitous internet access, provides usage of various convenient applications, and offers unique opportunities for maintaining unrestricted and spontaneous contact with others (Sarwar & Soomro, 2013). The use of a smartphone has reached figures over 50% in most developed countries(van Deursen, Bolle, Hegner, & Kommers, 2015). Especially in South Korea, owing to its advanced IT development, over 24 million Koreans owned a smartphone in 2013, and 84% of adolescents owned a smartphone in 2014 (Alam et al., 2014).

Smartphones are becoming a necessity for many people's daily lives, and they guarantee so much convenience to all the users. Particularly in adolescents, the smartphone has many attractive attributes and characteristics that make it highly addictive. It is known that adolescence represents a period of heightened biological vulnerability to addiction (Chambers, Taylor, & Potenza, 2014). The vast majority of people who suffer from addiction encountered the beginnings of their illness as adolescents (Wagner & Anthony, 2002). In case of the smartphone, adolescents are fascinated in embracing the new technology, with their greater motivational drives for novelty seeking, coupled with their immature inhibitory control system (Chambers et al., 2014). The possession and use of the smartphone by adolescents acknowledges personal autonomy, provides self-identity, offers entertainment, and favors establishment and maintenance of interpersonal relationships (Oksman & Turtiainen, 2004).

Studies have shown that addiction related to mobile or smartphone can lower academic performance, reduce offline activities, and cause family conflicts (Billieux, Van der Linden, & Rochat, 2008; Lobet-Maris, 2003). Also, its correlation with depression, anxiety, and sleep disturbance has been demonstrated (Jenaro, Flores, Gómez-Vela, González-Gil, & Caballo, 2007). Physically, excessive smartphone use may produce considerable stress on the cervical spine, thus changing the cervical curve and resulting in neck-shoulder pain (J. Park et al., 2015). Also, it has been reported that heightened anticipation about incoming phone calls or messages are associated with motor vehicle crash risk (O'Connor et al., 2013). Additionally, the smartphone is used as a medium of cyberbullying, and smartphone ownership and frequent use of smartphone significantly elevated the odds of becoming either

a cyber-bully or a cyber-victim (Englander, 2013).

The purpose of the present study was to examine the prevalence of young adolescents in high risk of smartphone addiction and psychological factors associated with smartphone addiction. We hypothesized that adolescents in high risk of smartphone addiction have more emotional and behavioral problems than others.

# II. METHODS

## A. Subjects

This cross-sectional survey was conducted in an all-boys-middle school in Gong-ju, a city in South Korea, in 2014. All the students and their parents provided a written informed consent after receiving an explanation on the study and assurance of confidentiality. The students were requested to complete the questionnaires in a classroom under the supervision of a research assistant. Total of 504 students participated in this research and 14 students were excluded due to incomplete questionnaires, resulting in 490 students.

## B. Measurements

Smartphone Addiction Scale-Short Version(SAS-SV) is a self-report on smartphone addiction consisting of 10 items with a six-point scale(Kwon, Kim, Cho, & Yang, 2013). The 33 questions that were previously used for the Smartphone Addiction Scale were inefficient for the adolescent group due to its large number of questions and its use was limited to diagnose addiction as cut-off values were not suggested. SAS-SV is designed to identify the level of the smartphone addiction risk and to distinguish the high risk group. In case of SAS-SV, cut-off value of 31 for boys, and 33 for girls distinguished the high-risk group for smartphone addiction. Also, a higher overall score indicates greater severity of smartphone addiction.

Youth Self Report(YSR) is a prominent and widely used self-report measure for the assessment of emotional and behavioral problems, designed for adolescents ages 11 t0 18(Achenbach & Rescorla, 2001). 119 items on the YSR measure 8 sub-scale symptoms:

Withdrawn, Somatic Complaints, Anxiety/Depressed, Social Problems, Thought Problems, Attention Problems, Aggressive Behavior, and Delinquent behaviors. An additional scale, Self-Destructive/Identity problems may be scored for boys only. The sub-scales may be grouped into two broader scales. The Internalizing grouping consists of the sum of the scores of the Withdrawn, Somatic Complaints, and Anxious/Depressed scales. The Externalizing grouping consists of the sum of the scores of the Delinquent and Aggressive Behavior scales. Overall behavioral and emotional functioning is measured by the Total Problem Scale. An adolescent selects his or her response from 0(not true) to 2(very true or often true).

The Rosenberg Self-Esteem Scale(RSES) is a widely used self-report instrument for evaluating individual self-esteem(Rosenberg, 1965). A 10-item scale is answered using a 4-point Likert Scale format ranging from strongly agree to strongly disagree. The total score ranges from 10 to 40, with 10 representing the lowest level of self-esteem and 40 the highest.

The Parent-Adolescent Communication Inventory(PACI) is a 20-item instrument that was designed to measure both content and process issues related to communication between adolescents and their parents(Barnes & Olson, 1985). Higher score on the scale reflects better communication with one's parents.

The Revised Children's Manifest Anxiety Scale(RCMAS) is a self-reported screening tool to measure anxiety in children aged 6 to 19 years that has demonstrated good reliability and validity(Reynolds & Richmond, 1978). It consists of 37 items, each of which requires a yes or no answer. Higher scores on the RCMAS indicate greater levels of anxiety.

**C. Statistical analysis**

First we distinguished the subjects into the high-risk group and the normal control

group according to the scores of SAS-SV, applying the suggested cut-off score of 31 for boys. Independent T-tests and Pearson chi-square tests were used to compare the sociodemographic characteristics and scores of YSR, RSES, PACI, and RCMAS between the two groups.

Second, correlation and multiple regression analyses were conducted to examine the relationship between smartphone addiction and the psychological factors. In multiple regression analyses, scores of SAS-SV was the dependent variable and the scores of YSR, RSES, PACI, and RCMAS were the predictor variables.

SPSS ver. 22.0 was used for the analyses, and significance level was set at 0.05. This study was approved by the ethics committee of Ajou University Medical Center.

# III. RESULTS

The average age of the participants was 14 ± 0.89, composed of 131(24.7%) 7th graders, 182(34.3%) 8th graders, 177(33.3%) 9th graders. 10(1.9%) reported being a smoker and 19(3.6%) had a drinking experience. 432(81.4%) lived with both parents, 36(6.8%) lived with one parent, and 22(4.1%) lived with neither. In regard to paternal education level, parents who had graduated college or more were most prevalent.

Among the 490 participants enrolled in the study, 9 were excluded because they didn't own a smartphone. Thus, the smartphone ownership rate was 98.16%. Of the 481 participants who owned a smartphone, 128(26.61%) were classified in the high risk group of smartphone addiction, and the rest 353(73.39%) were classified in the normal control group. The sociodemographic characteristics between the two groups showed no significant difference (Table 1).

**Table 1. Comparison of sociodemographic characteristics between the High Risk group and the Normal Control group**

| Variables | High Risk group (N=128) | Normal Control group (N=353) | P Value |
|---|---|---|---|
| Grade, n(%) | | | 0.165 |
| 7 | 32(24.8) | 97(75.2) | |
| 8 | 41(23.0) | 137(77.0) | |
| 9 | 55(31.6) | 119(68.4) | |
| Smoking, n(%) | | | 0.633 |

| | | | |
|---|---|---|---|
| Yes | 2(20.0) | 8(80.0) | |
| No | 126(26.8) | 345(73.2) | |
| Drinking, n(%) | | | 0.119 |
| Yes | 8(42.1) | 11(57.9) | |
| No | 120(26.0) | 342(74.0) | |
| Living with parent(s), n(%) | | | 0.226 |
| Both parents | 108(25.4) | 317(74.6) | |
| One parent | 13(38.2) | 21(61.8) | |
| None | 7(31.8) | 15(68.2) | |
| Father education level, n(%) | | | |
| College or more | 63(26.4) | 176(73.6) | |
| High school | 49(27.7) | 128(72.3) | |
| Middle school or less | 2(22.2) | 7(77.8) | |
| Don't' know | 14(25.0) | 42(75.0) | |
| Mother education level, n(%) | | | |
| College or more | 66(27.6) | 173(72.4) | |
| High school | 46(25.4) | 135(74.6) | |
| Middle school or less | 1(14.3) | 6(85.7) | |
| Don't know | 15(27.8) | 39(72.2) | |

The mean severity of smartphone addiction on the SAS-SV was 23.92 (SD=11.30).

The average SAS-SV score of the high risk group was 38.89±7.13 and that of the normal

control group was 18.49±6.69 (Table 2). The high risk group scored higher than the normal control group in the YSR, including all the scores of the 9 subscales, internalizing/externalizing problems, and the total score. The RSES score and the PACI score were lower in the high risk group, and the RCMAS score was higher in the high risk group compared to the normal control group. All the differences were statistically significant.

**Table 2. Comparison of psychological factors between among the High Risk group and the Normal Control group**

| | High Risk group (N=128) (mean± SD) | Normal Control group (N=353) (mean± SD) | P value |
|---|---|---|---|
| SAS-SV score | 38.89±7.13 | 18.49±6.69 | 0.00 |
| YSR: Total score | 43.84 ± 26.71 | 26.31 ± 19.08 | 0.00 |
| Internalizing Problems | 14.03 ± 10.20 | 8.03 ± 7.57 | 0.00 |
| Withdrawn | 3.35 ± 2.94 | 2.10 ± 2.35 | 0.00 |
| Somatic complaints | 3.54 ± 3.19 | 1.99 ± 2.70 | 0.00 |
| Anxious/Depressed | 7.43 ± 6.21 | 4.07 ± 4.31 | 0.00 |
| Externalizing Problems | 12.30 ± 8.28 | 7.32 ± 6.30 | 0.00 |
| Delinquent Behaviors | 2.80 ± 2.32 | 1.93 ± 2.19 | 0.00 |
| Aggressive behaviors | 9.52 ± 6.41 | 5.40 ± 4.65 | 0.00 |
| Thought problems | 2.32 ± 2.13 | 1.44 ± 1.75 | 0.00 |
| Social problems | 2.84 ± 2.28 | 1.88 ± 2.07 | 0.00 |

| | | | |
|---|---|---|---|
| Attention problems | 6.18 ± 3.46 | 4.00 ± 2.78 | 0.00 |
| Self-destructive/Identity problems | 4.74 ± 4.15 | 2.37 ± 2.85 | 0.00 |
| Self-esteem score | 32.26 ± 6.09 | 36.09 ± 5.60 | 0.00 |
| PACI score | 65.86 ± 13.66 | 73.60 ± 14.42 | 0.00 |
| RCMS | 18.43 ± 7.02 | 12.42 ± 5.84 | 0.00 |

Pearson's correlations between smartphone addiction and subscales of the YSR, RESE, PACI, and RCMAS are shown in Table 3. The results indicated that smartphone addiction was positively correlated with withdrawn, somatic complaints, anxiety/depressed, social problems, thought problems, attention problems, delinquent problems, aggressive behavior, self-destructive/identity problems, and RCMAS. Smartphone addiction was negatively correlated with PACI and self-esteem score.

**Table 3. Correlation between SAS-SV, YSR, RCMAS, PACI, RSES.** SAS=Smartphone Addiction Scale- short version, Wit=Withdrawn, Som=Somatic, Dep=Depression/Anxiety, Soc=Social problems, Tho=Thought problems, Att=Attention problems, Del=Delinquent problems, Agg=Aggressive behavior, Ide=Self-destructive/Identity problems, RCMAS=Revised Children's Measured Anxiety Scale, PACI=Parent-Adolescent Communication Inventory, RSES=Rosenberg Self-Esteem Scale. *All coefficients had p-value <.000.

| | Wit | Som | Dep | Soc | Tho | Att | Del | Agg | Ide | RCMAS | PACI | RSES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAS | .287 | .272 | .345 | .234 | .265 | .384 | .257 | .411 | .406 | .398 | -.292 | -.347 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Wit | | .489 | .733 | .563 | .525 | .606 | .394 | .475 | .669 | .609 | -.404 | -.474 |
| Som | | | .482 | .322 | .473 | .397 | .332 | .392 | .456 | .458 | -.283 | -.302 |
| Dep | | | | .566 | .588 | .676 | .527 | .664 | .868 | .721 | -.375 | -.501 |
| Soc | | | | | .374 | .626 | .385 | .448 | .546 | .446 | -.268 | -.406 |
| Tho | | | | | | .534 | .393 | .497 | .586 | .520 | -.250 | -.371 |
| Att | | | | | | | .435 | .613 | .698 | .623 | -.329 | -.493 |
| Del | | | | | | | | .679 | .561 | .423 | -.252 | -.301 |
| Agg | | | | | | | | | .704 | .597 | -.290 | -.361 |
| Ide | | | | | | | | | | .669 | -.433 | -.583 |
| RCMAS | | | | | | | | | | | -.461 | -.612 |
| PACI | | | | | | | | | | | | .576 |

The results of multiple regression analysis indicated that more aggressive behavior on the YSR (β=0.593, t=3.825) and lower self-esteem on the RSES (β=-0.305, t=-2.258) were significantly associated with more severe smartphone addiction (Table 4).

**Table 4. Multiple regression analysis on smartphone addiction.** **p<0.05.

| Variables | $R^2$ | Adjusted $R^2$ | F | β | t |
|---|---|---|---|---|---|
| Aggressive behaviors | 0.243 | 0.219 | 10.279** | 0.593 | 3.825** |
| Self-esteem | | | | -0.305 | -2.258** |

# IV. DISCUSSION

In this study, 26.61% of the enrolled adolescents were in high risk of smartphone addiction. Among the studies which used the same scale as the present study, SAS-SV, prevalence of young adults in risk of smartphone addiction was estimated as 16.9%, 12.8%, 21.5% in Switzerland, Spain, and Belgium, respectively(Haug et al., 2015; Lopez-Fernandez, 2015). Such higher rate of smartphone addiction in this study could be due to Korea's high use of smartphone. As South Korea prides itself on being the global leader in high-speed Internet and advanced mobile technology, its rate of smartphone ownership is among the highest in the world (Alam et al., 2014; Lee et al., 2014).

As we hypothesized, adolescents in high risk of smartphone addiction showed significantly more severe levels of psychopathologies, including withdrawn, somatic complaints, social problems, thought problems, attention problems, aggressive behavior, delinquent behavior, self-destructive/identity problems, anxiety and depression. Also, those in high risk of smartphone addiction showed lower self-esteem, higher levels of anxiety, and poorer quality of communication with their parents. Our results of multiple regression analysis revealed that the severity of smartphone addiction is associated with high level of aggressive behavior and low self-esteem. However, only 21.9% of the variance in behavioral consequences was explained with the model.

Many studies have revealed a close relationship between aggression and internet addiction. In terms of specific contents, online chatting, pornography, online gaming, and online gambling were all found to be associated with aggressive behavior (Ko, Yen, Liu,

Huang, & Yen, 2009). Zimbardo proposed that on the internet, anonymity and loss of individual responsibility results in a deindividuated state of oneself (Zimbardo, 1969). Deindividuation effect would lead to decreased self-observation or self-awareness, minimize the concern for social evaluation, weaken controls based on guilt, shame, and fear, and then lower the threshold for exhibiting proscribed socially inhibited behaviors (Reicher, Spears, & Postmes, 1995) It can be postulated that since smartphone enables one to access the internet more easily and more frequently, impact of aggression on smartphone could be even greater than that on the internet. Moreover, participants in our study were all male. It is known that men are more aggressive than women, possibly due to the differences in social roles and biological features between sexes (Lightdale & Prentice, 1994). Therefore, we may assume that male students would use more aggressive online contents (K. Kim, 2013), which could have affected our study result.

Low self-esteem is one of the characteristics of the addictive personality (Marlatt, Baer, Donovan, & Kivlahan, 1988). Individuals who do not value themselves highly are more likely to bow to peer pressure which makes them vulnerable to engage in addictive behaviors (Zimmerman, Copeland, Shope, & Dielman, 1997). Also, lack of self-worth can keep people trapped in addiction (Marlatt et al., 1988). In case of smartphone addiction, low self-esteem has been proposed to be predictors of mobile phone and smartphone addiction (Ha, Chin, Park, Ryu, & Yu, 2008). In a study which examined the profiles of smartphone addicts, low self-esteem, fear of rejection and need for approval were found to be important characteristics of smartphone addicts (Lapointe, Boudreau-Pinsonneault, & Vaghefi, 2013). The supportive function of peer relationships is particularly decisive in adolescence (Brown

& Larson, 2009). Adolescents with low self-esteem or negative self-image may tend to seek reassurance and intimacy in the virtual world where they would build a new, confident self (Lapointe et al., 2013).

The result of this study could also be explained in the context of South Korea's society which puts great emphasis on academic achievement for adolescents (B. Kim, Lee, Kim, Choi, & Lee, 2015). Korean adolescents are known to have heavy schoolwork, highly-competitive social atmosphere, and high expectations for good academic performance. The average amount of time Korean adolescents devote in studying was 7 hours 50 minutes per day, which was much longer than that of other countries, which ranged from 3 to 6 hour (*The State of Korean Children and Adolescents Seoul*, 2009). Inevitably, Korean adolescents experience high levels of stress due to problems associated with academic performance, and academic stress is found to be a main predictive factor for aggression (M. Park, Choi, & Lim, 2014). At the same time, Korean adolescents spent less time sleeping (7 hours 30 minutes per day) and exercising (13 minutes per day) than other adolescents from England, the United States of America, Holland, Sweden, and Finland (*The State of Korean Children and Adolescents Seoul*, 2009). Exercise allows for a discharge of aggression, reduces emotional strain, and promotes elevated self-esteem (Gerber, Kellmann, Hartmann, & Pühse, 2010). Low levels of physical activity, poor sleep, and high academic stress are reported to be contributors to the high prevalence of problematic internet use in Korean adolescents (S. Park, 2014). It could be suggested that we attribute the relatively high prevalence of smartphone addiction in this study and its correlation with aggression and self-esteem to high academic stress and low levels of physical activity of Korean adolescents. Further studies on

the relationship between adolescent's smartphone addiction and academic stress and levels of physical activity are needed.

This study has several limitations that need to be addressed. First, the generalizability of this research may be limited by the characteristics of our participants, since it is a single-site study with all male participants. Second, because of the cross-sectional and correlational nature of the study, the current study alone is insufficient to provide evidence of causal relationships. Especially many socio-demographic factors that could have affected both smartphone addiction and emotional and behavioral problems were not controlled. The implementation of analytical methods, that can examine causal relationships, rather than merely examining the degree of associations, is recommended so that antecedents and consequences of smartphone addiction can be clearly evaluated. Third, we only evaluated the severity of smartphone addiction, but examining the contents and patterns of smartphone use would have been useful. Many insist that problems arise from various activities enabled by the internet rather than the medium itself (Van Rooij, Schoenmakers, Van de Eijnden, & Van de Mheen, 2010). Fourth, our results based on self-reported questionnaires could suffer from social desirability bias. Lastly, the validity of the cut-off score of SAS-SV which we used to distinguish the high risk group of smartphone addiction could be questioned. The cut-off value of 31 for boys in SAS-SV had a positive value of 62% and a negative predictive value of 97%(Kwon et al., 2013). Figure 1 shows the distribution of SAS-SV scores of the participants in this study, and the cut-off score of 31 does seem adequate.

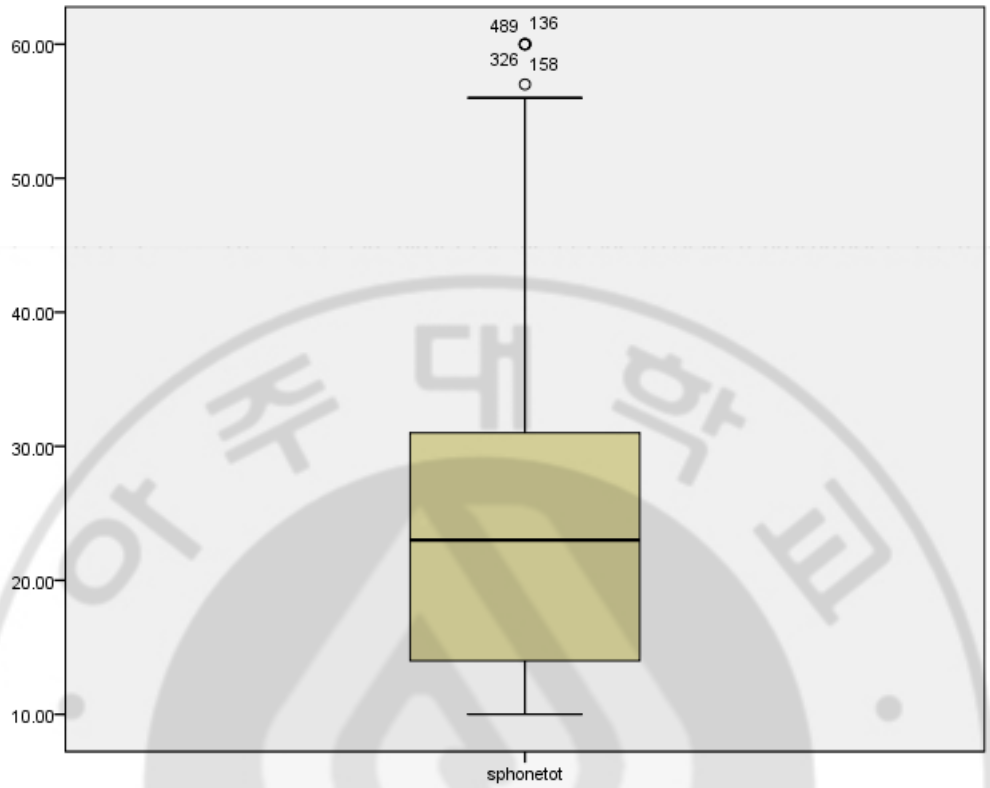


**Figure 1. Distribution of smartphone addiction scale scores of the participants.**

# V. CONCLUSION

The current study provided empirical evidence to increase our understanding of smartphone addiction. We found that young adolescents in risk of smartphone addiction show more severe levels of behavioral and emotional problems, lower self-esteem and poorer quality of communication with their parents compared to those in normal risk. Particularly we found association between smartphone addiction and aggressive behavior and self-esteem. We emphasize the importance of continued research not only in the area of smartphone, but also in other areas of information technology. Further exploratory and confirmatory studies should consider different sites, demographics, technological mobile devices/platforms, and applications.

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# 청소년들의 스마트폰 중독과 연관된 심리적인 요인에 대한 고찰

스마트폰은 첨단 정보기술(IT)의 혁신적인 제품이지만, 청소년들을 특히 중독 위험에 빠뜨리는 위험성이 있다. 본 연구의 목적은 중학생들에서 스마트폰 중독 고위험군의 유병률을 확인하고 스마트폰 중독과 관련된 심리적인 요인들을 살펴보고자 한다. 총 490 명의 중학생들이 스마트폰 중독, 행동 및 정서 문제, 자존감, 불안감, 부모와의 의사소통의 정도를 측정하는 자가설문지를 작성하였다. 128(26.61%)의 중학생들이 스마트폰 중독 고위험군에 해당하는 것으로 밝혀졌다. 스마트폰 중독 고위험군에 속하는 중학생들은 정상대조군에 비해 행동 및 정서 문제가 더욱 심각하였으며, 자존감이 더 낮고, 부모와의 의사소통의 질이 낮다는 것을 알 수 있었다. 다중회귀분석을 통하여 스마트폰 중독과 공격적인 행동($\beta$=0.593, t=3.825), 그리고 자존감(($\beta$=-0.305, t=-2.258)과의 연관성을 확인할 수 있었다. 후속연구에서 스마트폰 중독과 인터넷 중독을 비롯한 여러 다양한 IT 매체의 중독에서 공통적으로 적용할 수 있는 생물학적, 혹은 심리적인 이론들에 대한 고찰이 제시되기를 기대한다.

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핵심어 : 청소년, 스마트폰 중독, 심리적인 요인, 자존감, 공격적인 행동