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RESEARCH ARTICLE

Predictors of online game addiction among Korean adolescents

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ABSTRACT

Given the rapid growth of mobile games, one of the main purposes of this study is to analyze the effect of online gaming on addiction by classifying it into PC online gaming and mobile gaming. This study aims to analyze the extent to which playing games after midnight affects addictive behavior. In addition, this study analyzes the impact of game genres, parental factors, the leisure environment and relationship satisfaction on game addiction. About 1556 students living in five major Korean cities were sampled. Online game playing time was an important predictor of game addiction, especially among those who played PC online games late at night. Among the game genres, RPG, simulation and casual games were positively associated with addictive behavior. While play and the leisure environment had little effect on game addiction, the extent of satisfaction with relationships with parents, friends, and teachers did have a significant influence. However, parental attachment and parental mediation did not impact game addiction.

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Introduction

Games occupy an important part of the leisure activities of young people in Korea. According to statistics, during weekends and holidays 57.7% of young people enjoy watching TV and DVDs, and 41.9% play computer games, while only 17.9% engage in cultural or artistic activities, and 14.5% participate in sports (Statistics Korea 2014). Especially now, given the spread of smart phones, the number of adolescents who enjoy playing games on mobile devices is increasing very rapidly. As of 2013, over 80% of Korean students had smart phones; these have diffused very rapidly throughout the population during the past few years (Statistics Korea 2014). Games are among the most popular applications used by middle and high school students on their smart phones (National Youth Policy Institute 2013).

Despite the many advantages of smart phones, smart phone addiction is becoming a serious problem. It should be no surprise that game playing can be an important indicator of smart phone addiction (National Youth Policy Institute 2013) or the Internet addiction (Jiang 2014).

Notwithstanding the rapid growth of mobile games, very few studies have compared the effect of mobile games and computer-based online game on addiction. One of the purposes of this study is to analyze the effect of online gaming on addiction by breaking it down into PC online games and mobile games. This study aims to analyze the extent to which game playing after midnight affects addictive behavior. As game addiction became a serious issue, the Korean Ministry of Gender Equality and Family (MOGEF) established a so-called 'forced shut down system,' in November 2011. This system prevents young

people under sixteen from accessing PC online games between midnight and 6:00 a.m. For this reason, the question of whether playing games after midnight increases the risk of addiction has important policy implications.

Many earlier studies on the causes of game addiction focused on the question of whether psychological or intraindividual factors (Choo et al. 2015), including low self-esteem (Kim & Davis 2009; Cho & Jang 2010), depression (Brunborg et al. 2014; Hyun et al. 2015), anxiety (Hyun et al. 2015), impulsivity (Kim 2012) and stress caused by studying (Kim 2012) were strongly related to addiction. Scant attention has been paid to the social relationships of young people. This study aims to fill that void by analyzing the extent to which young people's relationships with others contribute to the development of online game addiction. In addition, this study will investigate the impact of game genres on addiction, focusing in particular on gender differences and parental mediation in online game addiction. These variables have seldom been addressed in previous studies, which have only dealt with the predictors of online game addiction.

The definition of game addiction and related factors

Internet gaming disorder was included in the *Diagnostic and Statistical Manual for Mental Disorders* (DSM-5) for the first time because of an increased risk of clinically significant problems associated with gaming (Petry et al. 2014). The criteria used to identify game addiction include preoccupation, withdrawal, tolerance, unsuccessful attempts to stop, loss of interest in other activities, excessive gaming despite problems, deception, escapism and jeopardized relationships (Petry et al. 2014). Most definitions of game

addiction include compulsive or uncontrollable dependence on gaming, such that cessation brings about emotional or mental reactions (Hussain et al. 2012). In this study, we use a scale developed by the Korean creative content agency (2010), to measure problematic game use. This scale is similar to the game addiction scale developed by Lemmens et al. (2009). In their study, game addiction is defined as 'excessive and compulsive use of computer or video games that results in social and/or emotional problems' (Lemmens et al. 2009, p. 78).

Many previous studies have analyzed the causes of online game addiction, which range from psychological to situational factors (Young et al. 2011). Based on existing studies, we have proposed the following factors as important predictors of online game addiction.

The time of day and length of time spent gaming

The time of day and length of time spent gaming are important factors, which increase online game addiction. Adolescents who spend more time playing games are more likely to be trapped in the world of online games (Hussain et al. 2012; Ministry of Gender Equality and Family 2014; Wang et al. 2014). The duration of the games played also affects game addiction (Yoon et al. 2014). Young people in particular often stay up late at night to play games. However, to our knowledge, very few studies have investigated the effect of this pattern on game addiction.

Parental factors

Parents play an important role in reducing game addiction. Parent-child closeness (Choo et al. 2015), a warm family environment (Liau et al. 2015), communication, or conversations between parent and child (Kim 2012) and perceived family harmony (Wang et al. 2014) are all associated with lower levels of game addiction. In addition, parental mediation, a strategy used by parents to mediate and mitigate the negative effect of the media on children (Clark 2011) can affect addictive behavior. However, few studies have explored its impact in the digital environment. Only a few studies have investigated its influence on addiction. According to one Korean study, restrictive mediation, active mediation and cousing had no effect on game addiction, while only restrictive mediation helped to reduce time spent gaming (Lim & Cho 2011). Choo et al. also found that parental restrictions had no effect on the pathological symptoms of video gaming among Singaporean adolescents (Choo et al. 2015). However, another Chinese study (Xu et al. 2012) showed that parental monitoring was related to low levels of game addiction, and one Korean study showed that an active mediation strategy was effective in reducing Internet addiction (Lee & Jeon 2010). However, as stated earlier, very few studies have explored the effect of parental mediation on children's game use. It is therefore difficult to say which strategy is more effective in reducing the negative impact of games, including game addiction, on young people.

Game-related factors

Adolescents are attracted to games because their structure and appealing features encourage longer and longer playing. The elements of game structure that lead to game addiction include obsessive compulsiveness, excessive compensation, and a sense of superiority (Ministry of Gender Equality and Family 2012). In other words, online games encourage users to take on many roles in relation to others, thus immersing themselves in the game (obsessive compulsiveness). In addition, as gamers play longer, they are rewarded by improvements to their game skills, level and money (excessive compensation). Game structures that encourage competition and superiority encourage users to become more addicted to particular online games (a sense of superiority). Young people are also attracted to online games that offer freedom, vividness, rewards, group identity and recreation (Tone et al. 2014). Adolescents who enjoy playing massive multiplier online role-playing game (MMORPG) have shown a greater tendency to develop addictive behavior (Blinka & Smahel 2011). Those who play multiplayer online games have a higher risk of developing gaming addiction than those who prefer single player games (Wang et al. 2014). Unlike single player games, multiplayer games allow many players to collaborate and compete. This genre is based on the interactions of game characters called avatars, which represent the identities of players (Blinka & Smahel 2011). Thus, the extent of a player's identification with his or her avatar in MMORPG games is a strong indicator of game addiction (You et al. 2015). Despite these examples, studies that explore the influence of diverse game genres on game addiction are rare.

Leisure activities

The importance of leisure activities in reducing online game addiction has been confirmed by many studies. For instance, taking part in extracurricular activities and attending family gatherings or parties hosted by friends can reduce the risk of high levels of online game playing and addiction (Xu et al. 2012). Participation in sports activities also helps to alleviate Internet game addiction (Cho & Jang 2010). According to a study by Yoon et al. (2014), students who faced more restrictions or constraints on their leisure activities were more likely to be addicted to one or more Internet games. For this reason, ensuring that adolescents actively participate in outdoor activities is a critical factor in preventing game addiction.

Interpersonal relationships

People who have interpersonal difficulties and limited social support are more likely to be drawn into gaming or other online activities because they offer a connection to virtual worlds (Young 2011). Bronfenbrenner's ecological systems theory holds that the different environments we encounter throughout our lives may influence our behavior in various ways (Bronfenbrenner 1979). According to this theoretical framework, an adolescent's behavior is shaped by a microecological system that includes family, peers and the school environment. Thus, the parent-child relationship and

interpersonal relationships (Liu & Kuo 2007), parent-adolescent conflict (Yen et al. 2007) and social support from family or friends (Gunuc & Dogan 2013) were significantly related to internet addiction. Taking part in social activities with parents, such as eating in restaurants and watching movies was negatively correlated with game addiction (Jeong & Kim 2011). Accordingly, the extent to which adolescents have satisfactory relationships with their parents and peers is associated with their degree of addiction. Adolescents are also socialized and influenced by their school or local community. However, few studies have explored the impact of adolescents' relationships with significant others, including teachers and neighbors.

The background of game addiction and policy in Korea

In Korea, adolescents spend a lot of time gaming with their friends at PC bang (PC rooms), which are equipped with computers that have large screens and high-quality sound. According to one survey, Korean adolescents spent an average of one and half hours (96 min) gaming every weekday, and a little less than three hours (168 min) on weekends (Ministry of Gender Equality and Family 2011). Nine percent of adolescents were classified as addicts (potential risk users + high risk users) of online games. Of these, 13.4% were male and 4.0% were female (National Youth Policy Institute 2009).

The spread of smart phones is changing the pattern of gaming, from a network of PCs to one that primarily uses mobile phones. More and more mobile games, such as *Dragon Flight* and *Anipang* have entered the lists of adolescents' favorite online games (Ministry of Gender Equality and Family 2013). It is well known that users can play mobile games at any time or place because of their easy portability, immediacy and accessibility. According to the Korea Creative Content Agency (KCCA) survey, teenagers use mobile games mainly to kill time whenever it is convenient to do so (KCCA 2015).

We can explain the prevalence of game addiction in Korea in the following ways. First of all, the education system is focused on getting better grades and sending students to top-level universities. Korean students therefore spend a lot of time studying, not only at school, but also at private educational institutions. Parents want their children to have good jobs and to succeed in society. For this reason, they put pressure on their children to study, and the children tend to find schoolwork very stressful. This leads them to relax by playing games. They spend a lot of time gaming to alleviate the stress caused by studying. Several studies have shown that adolescents' need for escapism – escaping from real life problems and worries – has played a major role in increasing the prevalence of game addiction (Xu et al. 2012). Many Korean adolescents attribute their game addiction to an educational system that focuses exclusively on college entrance examinations, and on a shortage of leisure facilities, rather than psychological factors or the family environment (National Youth Policy Institute, 2014). In this study, adolescents felt that expanding leisure activities and reforming the education system would be the most effective way to reduce game

addiction. They also cited the lack of leisure facilities as a contributing factor; there are few places in Korea where young people can play outside or take part in leisure and outdoor activities. Because there are few good alternatives, gaming is an important part of their daily lives. Availability of commercial PC rooms also contributes to the game addiction phenomenon. In metropolitan areas like Seoul and Pusan, there are many PC rooms. The PC bang has become a community center, where youths convene with their friends, acquaintances and dates outside the home (Jin & Chee 2009). As of 2013, there were 13,796 PC bangs in South Korea, a decrease from 14,782 in 2012 (Korean Creative Content Agency 2014). Having access to the Internet at Internet cafes has also had a positive influence on the Internet addiction (Jiang 2014), particularly as adolescents who used the Internet for the first time in an Internet café were more likely to be addicted to the Internet (Wang et al. 2013).

In Korea, gaming is a complicated national issue. Parents tend to think that gaming hinders children's study and academic work. Therefore, they favor policies that regulate Internet use, including online games. On the other hand, young people consider gaming one of their most important leisure activities and oppose policies that would restrict the use of games. As mentioned earlier, the Korean government has established a 'forced shut down system' to protect young people from overusing games and ensure that they have sufficient sleeping time. However, this policy has been criticized by many young people. In July 2012, the Ministry of Culture, Sports, and Tourism (MCST), which is responsible for the development and promotion of the game industry, established its so-called 'selective shut down system'. Under this system, game companies agree to enforce a restricted gaming time zone (e.g., from 1:00 a.m. to 8:00 a.m. on Saturday and Sunday) for users under 18, if their parents request it. There is accordingly a significant difference between the MOGEF and MCST approaches to combating game addiction or overuse among adolescents. While the former aims to protect young people by emphasizing the negative effects of gaming, the latter promotes the games industry by highlighting both the positive and negative effects of gaming.

Parents and their children and MOGEF and MCST take very different approaches to solving the problem of game addiction. However, it is clear that game addiction has become a serious problem, exacerbated by the spread of mobile devices such as smart phones and tablet PCs. In Korea, the debate continues over whether a forced shut down system should be applied to mobile games.

Research method

Sampling

We conducted a self-administered survey among students attending middle and high school (7th, 8th, 10th and 11th grade). Students in grade 12 were not contacted because they were preparing for college entrance examinations. To ensure two high school and two middle school grades, we excluded grade 9 students from the analysis. We selected five

metropolitan cities as our sample regions: Seoul, Pusan, Daejeon, Daegu and Gwangju. In each city, we sampled about 300 students. In total, 20 middle schools and 15 high schools were selected and two classes in each school were randomly chosen. Because this study aimed to investigate online game use and its effect on young people, students who had used online games at least once in the past three months were asked to respond to survey questionnaires. Data from 1556 Korean students were collected and analyzed. The survey was conducted from mid-May to mid-June in 2014. Fifty-one percent of the respondents were male and 52.8% of the students attended middle school. Almost all of the students (96.4%) had mobile phones, and most of them (67.9%) used fourth-generation (4G) smartphone.

Measures

Game addiction scale

As mentioned earlier, we used the Problematic Game Use scale developed by the Korean Creative Content Agency in 2010 as our game addiction scale. This scale consists of seven factors: tolerance ($\alpha = 0.87$), withdrawal ($\alpha = 0.91$), excessive use of time ($\alpha = 0.90$), loss of control ($\alpha = 0.92$), obsessive use ($\alpha = 0.80$), hindrance to daily lives ($\alpha = 0.84$) and continued use despite consequences ($\alpha = 0.84$). Each factor contains three items (Table 1). The possible answers for each item are *never* (0), *sometimes* (1), *often* (2) and *almost always* (3). For each factor, the score ranges from 0 to 9 points.

To classify addicts and nonaddicts, we used the polythetic format, which requires the endorsement of at least half of the criteria (Lemmens et al. 2009). An item was considered met when it received a score of sometimes, often or almost always. Thus, respondents who endorsed at least four out of seven factors, scoring three points or above for each factor, were classified as problematic and addicted users.

Demographic variables

Gender was divided into male (0) and female (1) and the schools categorized as middle schools (0) and high schools (1). The family's economic level was measured using the respondents' subjective judgment of their economic situation (from 1 = very poor to 7 = very rich, $M = 2.94$, $SD = 0.99$).

Average online gaming time per day

We asked respondents to indicate how much time they spent using online games on weekdays and (separately) on weekends. To calculate the average hours per day spent playing

online games, the hours of weekday play were multiplied by 5, and the hours of weekend play were multiplied by 2. The total was then divided by 7. We recoded the average times into a five-point Likert scale ranging from 1 (less than 30 minutes) to 5 (more than 2 hours).

Online game use after midnight

For young people, games are a very addictive medium. They tend to stay up late at night playing online games. We asked the students how often they had played online games between midnight and 6:00 a.m. during the past three months (1 = Never, 2 = Less than once a week, 3 = Once or twice a week, 4 = Three or four times a week, 5 = More than five times a week).

Preferred game genres

Following the policy report of the Ministry of Gender Equality and Family (2012), we classified game genres into seven types. An RPG (role-playing game) is the type of game in which users take on roles, while a simulation game is a video game that simulates reality. A shooting game belongs to the genre in which users destroy something with weapons and an action game involves fast-paced fighting. Games designed for useful purposes rather than entertainment (e.g., to educate users about healthcare, defence, education or other aspects of life) are serious games. Casual games, such as card or puzzle games are a genre that anyone can easily enjoy. Finally, sports/racing games belong to the genre that focuses on popular sports or speed. The strength of each participant's preference for particular game genres was measured using a 4-point Likert scale (ranging from 1 = Never to 4 = Very much).

Parental attachment

Following the Korean Children and Youth Panel Survey (National Youth Policy Institute 2012), we used six statements to measure parental attachment, including, 'I try to spend a lot time with my parents' and 'My parents always show me love and affection.' These items are based on the work of Hirschi (1969). Each item was measured using a four-point Likert scale (from 1 = never to 4 = always). The Cronbach's α for this scale was 0.942.

Parental mediation

We investigated which parental mediation strategy was used in each of our respondents' families. Based on Lim and

Table 1. Components of scale.

Factors	Example	M (SD)	Cronbach's α
Tolerance	I spend a lot of time gaming in order to obtain the satisfaction I want.	1.08 (1.56)	0.87
Withdrawal	I become anxious or nervous when I stop gaming or reduce my gaming time.	0.88 (1.54)	0.91
Excessive use of time	I spend much more time gaming than I mean to.	0.69 (1.38)	0.90
Loss of control	I tried to stop gaming but failed.	1.03 (1.62)	0.92
Obsessive use	I spend most of my time thinking about games.	0.67 (1.36)	0.80
Hindrance to daily life	My grades fell because of games.	0.80 (1.52)	0.84
Continued use despite consequences	I continue gaming although it is damaging my health (e.g., shoulder pain, weakness of vision).	0.60 (1.27)	0.84

Cho (2011), we classified these approaches as restrictive mediation, active mediation, and co-using, and then added the additional category, 'no mediation.' Restrictive mediation included three items: 'my parents unilaterally determine the time I can play games,' 'my parents check how much time I spend gaming,' and 'my parents interrupt me when I play games.' Active mediation contained two items: 'my parents tell me which games are useful,' and 'my parents gather information about a wide range of games.' Co-using is measured by a single item: 'my parents enjoy playing games with me.' No-mediation also comprises a single item: 'my parents do not care whether or not I play games.' Each item was measured using a four-point Likert scale (from 1 = strongly disagree to 4 = strongly agree). The Cronbach's α for restrictive mediation and active mediation was 0.78 and 0.80, respectively. The average scores came to: 2.03 (restrictive mediation), 1.54 (active mediation), 1.48 (co-using), and 2.13 (no mediation).

Play and leisure environment

This variable included four items. We asked students how many or much of the following they had access to (1) recreation and leisure facilities, (2) money to spend on recreation and leisure, (3) time to spend on recreation and leisure and (4) friends to play and spend leisure time with. Each item was measured using a four-point scale (from 1 = completely insufficient to 4 = absolutely sufficient) and averaged. The Cronbach's α for this scale was 0.804.

Satisfying relationships with others

We asked respondents to what extent they were satisfied with the relationships they had with (1) family, (2) friends, (3) teachers and (4) neighbors. Each item was measured using a four-point scale (from 1 = very unsatisfied to 4 = very satisfied) and averaged. The Cronbach's α for this scale was 0.871.

Results

Online game use and genre preferences

Respondents spent 53.44 min on PC online games and 55.96 min on mobile games on weekdays; on weekends they spent 108.93 min and 76.29 min, respectively. In other words, respondents played PC games more often than mobile games, especially on weekends. The average time spent playing online games per day was 69.29 min for PC games and 61.49 min for mobile games.

When it came to online game use during the midnight period, 28.2% of respondents (PC games) and 48.7% of respondents (mobile games) used online games at least once after midnight. Adolescents tended to play mobile games more often late at night.

When asked about their genre preferences, a little more than half of the respondents preferred RPG and Sports/Racing. The percentage of respondents answering, 'I like it a little' and 'I like it very much' was the highest for RPG (55.3%), followed by sports/racing (53.2%), shooting (45.1%),

simulation (41.3%), casual games (37.3%), action (36.1%) and serious games (16.8%). When we analyzed the respondents' genre preferences by gender, we found a great difference. Male students preferred RPG, simulation, shooting, action and sports/racing games much more than female students did, which was statistically significant (each $\chi^2 = 105.3$, $p < 0.001$, $\chi^2 = 64.6$, $p < 0.001$, $\chi^2 = 233.1$, $p < 0.001$, $\chi^2 = 212.1$, $p < 0.001$, $\chi^2 = 98.8$, $p < 0.001$). Likewise, female students liked casual games more than male students did ($\chi^2 = 115.1$, $p < 0.001$). There was little gender difference when it came to the preference for serious games ($\chi^2 = 7.1$, n.s.).

The components and prevalence of game addiction

As shown in Table 1, out of seven game addiction factors, students scored highest in factors such as tolerance and loss of control.

This shows that the students became more and more immersed in the games as time passed, and had less control over the time spent gaming. The average score on the online game addiction scale was 0.82 ($SD = 1.30$).

According to the criteria mentioned earlier, we calculated the percentage of addicts and found that 11.4% of our participants were addicts.

The difference between addicts and nonaddicts

Table 2 shows the variable differences that separated the addicts from the nonaddicts. There were three times more male addicts (17.6%) than female addicts (5.0%). However, there was little difference in school type or mobile phone type. Although it was not statistically significant, the percentage of addicts was higher among students with feature phones or without phones than among students with smart phones. Not surprisingly, there was a striking difference in the two groups' game addiction scores (26.62 vs. 3.06) and this difference was statistically significant ($t = 57.04$, $p < 0.001$).

Addicts spent about 2.5 times more time playing PC online games per day (146.46 vs. 59.22) and 1.6 times more time playing mobile games per day than nonaddicts (91.47 vs. 57.45). Students addicted to online games played games more frequently after midnight. Addicts had lower parental attachment, and lower satisfaction with their relationships than nonaddicts and this difference was statistically significant. The differences in play and leisure environments, however, were not statistically significant.

Predictors of game addiction

To analyze what determines whether one is addicted to online game or not, we conducted a logistic regression analysis with SPSS 22.0 (Chicago, IL). All variables were entered simultaneously into the analysis. As Table 3 shows, the input variables accounted for 32.6% of the total variance (Nagelkerke $R^2 = 0.326$). The prediction success was 89.9%.

Among demographic variables, gender had a significant effect on game addiction. Male students were much more

Table 2. Difference in variables between addicts and nonaddicts

Variables	Addicts % or M (SD)	Non-addicts % or M (SD)	Chi-square or <i>t</i> -value
Gender			
Male	17.6	82.4	60.1***
Female	5.0	95.0	
School type			
Middle	10.0	90.0	3.26
High	13.0	87.0	
Mobile phone type			
Feature (2G)	13.6	86.4	2.67
Smart (3G)	12.3	87.7	
Smart (4G)	10.3	89.7	
No phone	14.8	85.2	
Game addiction score (0–63)	26.62 (10.14)	3.06 (4.12)	57.04***
PC online gaming time per day (minutes)	146.46 (127.98)	59.22 (76.47)	12.88***
PC online gaming time on weekdays (minutes)	116.22 (126.83)	45.24 (73.60)	7.24***
PC online gaming time on weekends (minutes)	222.08 (182.35)	94.19 (119.4)	9.02***
Mobile gaming time per day (minutes)	91.47 (110.57)	57.45 (79.40)	5.05***
Mobile gaming time on weekdays (minutes)	81.69 (107.96)	52.48 (81.75)	3.45**
Mobile gaming time on weekends (minutes)	121.64 (153.28)	70.17 (98.80)	4.32***
PC game use after midnight	2.24 (1.28)	1.40 (0.80)	12.05***
Mobile game use after midnight	2.29 (1.41)	1.89 (1.13)	4.37***
Parental attachment	2.85 (0.96)	3.13 (0.73)	−4.58***
Play and leisure environment	2.80 (0.92)	2.81 (.71)	−0.24
Relationship satisfaction	3.03 (0.85)	3.30 (0.65)	−4.91***

p* < 0.01;*p* < 0.001.

likely to be addicted to online games than female students ($\beta = -1.02$, $p < 0.001$). Online gaming hours per day and the frequency of PC online game use after midnight increased the probability of online game addiction. In particular, the impact of playing PC online games was larger than that of mobile games. Adolescents who stayed up late at night to enjoy PC online gaming were more likely to have an addictive tendency.

With regard to game genres, the RPG, simulation and casual games were positively related to online game addiction. Respondents who preferred those genres were more likely to be addicts.

Parental variables had no effect on online gaming addiction. Neither parental attachment nor parental mediation played any role in alleviating online game addiction.

While the play and leisure environment did not have any effect on online game addiction, satisfying relationships with others decreased the odds of being addicted to online games ($\beta = -0.95$, $p < 0.001$). Respondents who were more satisfied with their relationships with family, teachers, or friends were less likely to be game addicts.

To analyze the gender effect, we separated participants into male and female groups and conducted a logistic regression analysis using the same variables as shown in Table 3. The results showed that for males, playing simulation and casual games enhanced the probability of being addicts (each $\beta = 0.22$, $p < 0.05$ and $\beta = 0.27$, $p < 0.05$), while for females, RPG and shooting games developed the risk of addiction statistically (each $\beta = 0.81$, $p < 0.01$ and $\beta = 0.64$, $p < 0.05$). While PC gaming time increased males' addictive tendency, mobile gaming time enhanced females' addictive tendency (each $\beta = 0.21$, $p < 0.01$ and $\beta = 0.56$, $p < 0.01$). PC gaming after midnight affected the gaming addiction of both males and females statistically (each $\beta = 0.45$, $p < 0.001$ and $\beta = 0.87$, $p < 0.001$). However, like the result of Table 3, parent variables and leisure environment had no effect on addiction among males and females. The effect of relationships with others on

Table 3. Logistic regression analysis of variables.

Variables	β	Odds Ratio	95% CI
Demographic variables			
Gender (female = 1)	−1.02***	0.359	0.212–0.606
School (high school = 1)	0.056	1.058	0.696–1.606
Economic level of family	0.075	1.078	0.637–1.824
Average online gaming time			
PC game	0.260***	1.297	1.127–1.492
Mobile game	0.171**	1.187	1.036–1.358
Game use after midnight			
PC game	0.569***	1.767	1.461–2.136
Mobile game	0.071*	1.074	0.901–1.279
Game genre			
RPG	0.243**	1.275	1.026–1.585
Simulation	0.201*	1.223	0.999–1.496
Shooting	0.002	1.002	0.801–1.253
Action	0.063	1.066	0.856–1.326
Serious game	−0.036	0.965	0.746–1.248
Casual game	0.188*	1.207	0.977–1.491
Sports/Racing	−0.004	0.996	0.827–1.200
Parental variables			
Parental attachment	−0.116	0.891	0.624–1.271
Restrictive mediation	0.165	1.180	0.872–1.596
Active mediation	0.017	1.017	0.727–1.423
Co-using	0.087	1.091	0.813–1.464
No mediation	−0.021	0.979	0.762–1.258
Play and leisure environment	0.075	1.078	0.746–1.557
Satisfaction of relationship with others	−0.956***	0.384	0.246–0.599
Nagelkerke R^2		0.326	

p* < 0.1;*p* < 0.05;****p* < 0.001.

game addiction was greater among females than males (each $\beta = -2.22$, $p < 0.001$ and $\beta = -0.77$, $p < 0.01$).

Discussion

We examined diverse factors related to online game addiction in the smart phone-saturated mediascape. Overall, addicts of online gaming made up 11.4% of the total respondents. Our finding was similar to the addiction rate found in other Asian studies; 15.7% among adolescents in Hong Kong

(Wang et al. 2014), and between 8.8 and 9.9% among adolescents in Singapore (Choo et al. 2015). However, a superficial comparison of these results is not very useful because of the different scales used to measure game addiction.

With regard to demographic variables, gender was strongly associated with game addiction. It is clear that male students are much more addicted to online games than female students are. This result is consistent with many previous studies (Huanhuan & Su, 2013; Wang et al. 2014; Yoon et al. 2014; Choo et al. 2015). However, the number of female students who enjoy playing mobile games is increasing rapidly. According to a research report published by the National Youth Policy Institute (2013) in Korea, 41.7% of male respondents enjoyed playing mobile games more than 5 days a week, as compared with 33.2% of female respondents. Given the spread and development of mobile games, female students are becoming more likely to be trapped in mobile gaming.

Online game playing time was an important predictor of game addiction, supporting many aforementioned research results. Interestingly, the influence of PC playing time on addiction was more significant than for mobile games. Although mobile games are spreading to adolescents, they seem to have less addictive power than PC online games. However, with the development of technology, more and more game users will enjoy playing MMORPG on a mobile platform in the near future. It is likely that this will increase adolescents' dependence on mobile games and increase their rate of addiction.

Students who played PC online games late at night showed a higher tendency toward game addiction. We therefore conclude that restricting adolescents' access to computer games after midnight is important in preventing game addiction. However, this result does not mean that the forced shutdown system should be strengthened, blocking young people's access to computer gaming. Although the Korean government does not allow middle school students to use online games after midnight, some students still manage to do it. It seems likely that they access online games by using other people's IDs. This policy has been criticized by many young people. More parental interest in children's gaming after midnight and more guidance are therefore needed. Parents need to monitor their children's gaming habits and patterns discretely, because parental monitoring does contribute to reducing game addiction (Xu et al. 2012). Addicted adolescents may play games late into the night. For this reason, the above finding should be interpreted cautiously.

Among the game genres, the RPG, simulation and casual games significantly increased the likelihood of addiction. Nevertheless, the effect of these variables was not very strong. This result is somewhat consistent with that of Jang et al. (2004). According to their study, the Internet addiction score was higher among adolescents who preferred RPG and simulation games than it was among those who preferred web board and action games. The addictive element of RPG has been noted in many earlier studies. In addition to this game genre, simulation and casual games increased online game addiction in young people.

Interestingly, there was a significant gender difference in relation to the increased probability of addiction.

Male students who liked simulation and casual games were at risk of developing an addiction, while female students who liked RPG and shooting were more at risk of addiction. One possible explanation for this result is that female students played RPG games to socialize with other gamers and for entertainment more than male students (Hussain & Griffiths 2008). They therefore tended to be more addicted to RPG games. Although casual games were popular among female students, they increased the risk of addiction among male students. This result also indicates that males become more trapped in games that are simple and do not take a long time to play. As casual games increase with the spread of smart phones, male students are likely to be more at risk of addiction to mobile gaming. This significant gender difference requires more detailed analysis in the future.

Unlike many of the previous studies mentioned earlier, our study found that parental attachment did not have a significant impact on game addiction. Parental mediation likewise did not play any role in reducing game addiction. This result suggests that the influence of parents on game addiction in young people is minimal in Korean society. As stated earlier, most respondents stated that their parents had no interest in their online gaming. The factors that increased the risk of Internet addiction at home were the parents' lack of interest in their children's online activities, and their lack of willingness to control children's time online (Wąsiński & Tomczyk 2015). Parents should therefore show more interest in their children's gaming behavior and discuss the problems of game overuse with their children. Rather than interfering or reducing their children's game time obtrusively or unilaterally, they should recognize the need to work with their children to set rules. Some examples of rules might include the following: 'Screen time – including mobile games – will be limited to two hours per day' and 'No mobile devices are allowed during meal time,' (see the Media Literacy Council 2015). Parental mediation based on interactions with children seems to be effective in preventing online game addiction, because children do not want to lose their autonomy. Although parental attachment did not reduce online game addiction, there was a difference in the scores of addicts and general users. This result indicates that more parental attachment is needed for addicted students.

While play and the leisure environment had little effect on game addiction, satisfaction with relationships did have a great influence. Adolescents who maintain more satisfactory relationships with their family, friends, teachers and neighbors are less likely to be addicted to online games. Unlike individualistic Western societies, Eastern Asian countries, including Korea, tend to emphasize the strong cultural importance of relationships among people (Nisbett 2003). Korean adolescents experience high levels of loneliness and alienation when family cohesion is lower and peer or teacher relationships are worse (Park & Doh 1998; Doh 1999; Jo & Bang 2003). Those who experience high levels of loneliness and alienation may seek friends and fun in cyberspace, leading to media addiction. Overall, loneliness and depression do lead to the addictive use of media, including mobile phones (Park et al. 2012) and games (Zhou 2010). The effect of the extent of relationships with significant others on addiction

level was especially stronger among female than male students, seemingly because females consider maintaining relationships with others and socialization important and are more active in seeking relationships in cyberspace (Hussain & Griffiths 2008; Levine & Stekel 2016).

What is therefore important for the prevention of addiction among young people is not a favorable recreation and leisure environment, but the students' subjective satisfaction with their key relationships. This result follows Bronfenbrenner's arguments that the microsystem setting, which includes family, friends, teachers, and neighbors, may influence adolescent behavior in varying degrees (Bronfenbrenner 1979).

Overall, this study suggests that enhancing the relationship between adolescents and those around them could help to prevent online game addiction. Reducing gaming play time and gaming after midnight were also important ways to alleviate game addiction.

Despite these interesting results, this study has many limitations. First of all, it did not include the emerging game genre, MOBA (Multiplier Online Battle Arena), typified by league of legends. With the development of the game industry and related technologies, future research needs to include new game genres and to analyze their effect on game addiction. The sampling used in this study was based on non-probability sampling. It is therefore difficult to generalize these results. Probability sampling that covers rural areas and small cities will be needed in future research. Finally, no inferences regarding causality can be made due to the cross-sectional and correlational nature of the data.

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References

- Blinka L, Smahel D. 2011. Addiction to online role-playing games. In: Young KS, de Abreu CN, editors. *Internet addiction: a handbook and guide to evaluation and treatment*. Hoboken, NJ: John Wiley and Sons. p. 73–90.
- Bronfenbrenner U. 1979. *The ecology of human development: experiments by nature and design*. Cambridge, MA: Harvard University Press.
- Brunborg GS, Mentzoni RA, Frøyland LR. 2014. Is video gaming, or video game addiction, associated with depression, academic achievement, heavy episodic drinking, or conduct problems? *J Behav Addict*. 3:27–32.
- Cho Y, Jang J. 2010. Relation among youth's participation grade in sports, self-esteem, and propensity to internet game addiction. *Korean J Sports Sci*. 19:207–218.
- Choo H, Sim T, Liau AKF, Gentile DA, Khoo A. 2015. Parental influences on pathological symptoms of video-gaming among children and adolescents: as prospective study. *J Child Fam Stud*. 24:1429–1441.
- Clark LS. 2011. Parental mediation theory for the digital age. *Commun Theory*. 21:323–343.
- Doh HS. 1999. Loneliness in early adolescences: relationships to peer experiences and attachments to parents. *Korean J Child Stud*. 20:33–49.
- Gunuc S, Dogan A. 2013. The Relationships between Turkish adolescents' internet addiction, their perceived social support and family activities. *Comput Human Behav*. 29:2197–2207.
- Hirschi T. 1969. *Causes of delinquency*. Berkeley, CA: University of California Press.
- Huanhuan L, Su W. 2013. The role of cognitive distortion in online game addiction among Chinese adolescents. *Child Youth Serv Rev*. 35:1468–1475.
- Hussain Z, Griffiths MD. 2008. Gender swapping and socializing in cyberspace: an exploratory study. *Cyberpsychol Behav*. 11:47–53.
- Hussain Z, Griffiths MD, Baguley T. 2012. Online gaming addiction: classification, prediction, and associated risk factors. *Addict Res Theory*. 20:359–371.
- Hyun GT, Han DH, Lee YS, Kang KD, Yoo SK, Chung U, Renshaw PF. 2015. Risk factors associated with online game addiction: a hierarchical model. *Comput Human Behav*. 48:706–713.
- Jang M, Lee E, Jang J, Lee J, Kim E, Lee M. 2004. A study on game addiction, need for internet use and psychosocial variables by game genre. *Korean J Counsel Psychother*. 16:705–722.
- Jeong EJ, Kim DH. 2011. Social activities, self-efficacy, game attitudes and game addiction. *Cyberpsychol Behav Social N*. 14:213–221.
- Jiang Q. 2014. Internet addiction among young people in China: internet connectedness, online gaming, and academic performance decrement. *Internet Res*. 24:2–20.
- Jin DY, Chee F. 2009. The politics of online gaming. In: Hjorth L, Chan D, editors. *Gaming cultures and place in Asia-Pacific*. New York: Routledge. p. 19–38.
- Jo AM, Bang HJ. 2003. The effects of parent, teacher, and friend social support on adolescents' game addiction. *Korean J Youth Stud*. 10:249–275.
- Kim H, Davis KE. 2009. Toward a comprehensive theory of problematic Internet use: evaluating the role of self-esteem, anxiety, flow, and the self-rated importance of Internet activities. *Comput Human Behav*. 25:490–500.
- Kim M. 2012. Influence of adolescents' psychological variables and attachment with parents upon internet game addicts and cellular phone addicts. *Korean J Hum Dev*. 19:1–22.
- Korea Institute for International Economic Policy and National Youth Policy Institute. (2014). *Comparative study on online game use of Korean and Chinese adolescents and policy on prevention of addiction and its cure*. Korean Creative Content Agency. 2010. *Comprehensive scale for assessing game behavior*.
- Korean Creative Content Agency. 2014. 2014 white paper on Korean games (Summary). [cited 2015 October 11]. Available from: <http://www.kocca.kr/cop/bbs/list/B0000147.do?menuNo=201825>.
- Korean Creative Content Agency. 2015. *Survey report on game users*. Naju, Korea: Korean Creative Content Agency.
- Lee SJ, Jeon SH. 2010. Parental mediation of children's internet use: effect on internet addiction. *Korean J Broadcasting Telecommun Stud*. 24:289–322.
- Lemmens JS, Valkenburg PM, Peter J. 2009. Development and validation of a game addiction scale for adolescents. *Media Psychol*. 12:77–95.
- Levine DT, Stekel DJ. 2016. So why have you added me? Adolescents girls' technology-mediated attachments and relationships. *Comput Human Behav*. 63:25–34.
- Liau AK, Choo H, Li D, Gentile DA, Sim T, Khoo A. 2015. Pathological video-gaming among youth: a prospective study examining dynamic protective factors. *Addict Res Theory*. 23:301–308.
- Lim S, Cho Y. 2011. Parents' and peers' mediation effects on adolescents' game play. *J Cybercommun*. 28:173–218.
- Liu C, Kuo F. 2007. A study of internet addiction through the lens of the interpersonal theory. *Cyberpsychol Behav*. 10:799–804.
- Media Literacy Council. 2015. *Hooked: the attraction of casual games*. [cited 2015 Sep 25]. Available from: <http://www.medialiteracycouncil>.

- sg/Lists/Resources/Attachments/200/Thepercent20Attractionpercent20ofpercent20Casualpercent20Mobilepercent20Games.pdf.
- Ministry of Gender Equality and Family. 2011. Survey on media use of young people. Seoul, Korea: Ministry of Gender Equality and Family.
- Ministry of Gender Equality and Family. 2012. A study on development of evaluation scale about adolescents' sound use of internet game. Seoul, Korea: Ministry of Gender Equality and Family.
- Ministry of Gender Equality and Family. 2013. Survey on internet game use of young people. Seoul, Korea: Ministry of Gender Equality and Family.
- National Youth Policy Institute. 2009. Study on the revitalization of family-oriented leisure program for the prevention of game addiction among young people. Seoul, Korea: National Youth Policy Institute.
- National Youth Policy Institute. 2012. Korean children and youth panel survey 2010 III report. Seoul, Korea: National Youth Policy Institute.
- National Youth Policy Institute. 2013. A study on policy measures to protect youths with the spread of smartphone. Seoul, Korea: National Youth Policy Institute.
- National Youth Policy Institute. 2014. Recognition of young people about the cause and solution of internet game addiction. Seoul, Korea: National Youth Policy Institute.
- Nisbett RE. 2003. *The geography of thought*. New York: Free Press.
- Park J, Kim G, Hong C. 2012. Relationships between adolescents cellular phone use motivation, peer relationships, emotional factors and cellular phone addictive use. *Korean J Clin Psychol*. 31:51–169.
- Park SY, Doh HS. 1998. The relations between family functioning and self-esteem and loneliness in adolescents. *Korean J Child Stud*. 19:229–244.
- Petry NM, Rehbein F, Gentile DA, Lemmens JS, Rumpf HJ, Mößle T, Bischof G, Tao R, Fung DS, Borges G, et al. 2014. An international consensus for assessing internet gaming disorder using the new DSM-5 approach. *Addiction*. 109:1399–1406.
- Statistics Korea. (2014). Youth Statistics in 2014. [cited 2015 Oct10]. Available from: http://kostat.go.kr/portal/korea/kor_nw/2/1/index.board?bmode=readandaSeq=328335.
- Tone H, Zhao H, Yan W. 2014. The attraction of online games: an important factor for internet addiction. *Comput Human Behav*. 30:321–327.
- Wang C, Chan CLW, Mak K, Ho S, Wong PWC, Ho RTH. 2014. Prevalence and correlates of video and internet gaming addiction among Hong Kong adolescents: a pilot study. *Scientific World J*. 2014:874648. doi: <http://dx.doi.org/10.1155/2014/874648>
- Wang L, Luo J, Bai Y, Kong J, Luo T, Gao W, Sun X. 2013. Internet addiction of adolescents in China: prevalence, predictors, and association with well-being. *Addict Res Theory*. 21:62–69.
- Wąsiński A, Tomczyk Ł. 2015. Factors reducing the risk of internet addiction in young people in their home environment. *Child Youth Serv Rev*. 57:68–74.
- Xu Z, Turel O, Yuan Y. 2012. Online game addiction among adolescents: motivation and prevention factors. *Eur J Inform Syst*. 21:321–340.
- Yen J, Yen C, Chen C, Chen S, Ko C. 2007. Family factors of internet addiction and substance use experience in Taiwanese experience. *Cyberpsychol Behav*. 10:323–329.
- Yoon MS, Kim NH, Park WK. 2014. The effects of game, leisure, family factors on the internet game addiction in middle school students. *Korean J Youth Stud*. 21:309–337.
- You S, Kim E, Lee D. 2015. Virtually real: exploring avatar identification in game addiction among massively multiplayer online role-playing games (MMORPG) players. *Games Culture*. [Epub ahead of print]. doi: 10.1177/1555412015581087.
- Young K. 2011. Clinical assessment of internet-addicted clients. In: Young KS, de Abreu CN, editors. *Internet addiction: a handbook and guide to evaluation and treatment*. Hoboken, NJ: John Wiley and Sons. p. 19–34.
- Young KS, Yue XD, Ying L. 2011. Prevalence estimates and etiologic models of internet addiction. In: Young KS, de Abreu CN, editors. *Internet addiction: a handbook and guide to evaluation and treatment*. Hoboken, NJ: John Wiley and Sons. p. 3–17.
- Zhou SX. 2010. Gratifications, loneliness, leisure boredom and self-esteem as predictors of SNS-game addiction and usage pattern among Chinese college students. Unpublished doctoral dissertation, The Chinese University of Hong Kong.