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Social Activities, Self-Efficacy, Game Attitudes, and Game Addiction

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Abstract

This study examines whether social activities with parents, online and offline social self-efficacy, and attitudes toward gaming are associated with the degree of game addiction among adolescents. Using data from a survey of 600 middle- and high-school students in South Korea, we tested the relationships of personal characteristics (grade point average and time spent on gaming each day), social self-efficacy (both on- and offline), general social activities (with parents, friends, and teachers), gaming activities with parents, and attitudes toward gaming (those of self, parents, friends, and teachers) with the degree of game addiction. In addition, we conducted ANOVA tests to determine the differences among three groups: non-addicts (NA), possible (mild or moderate) addicts (PA), and Internet addicts (IA). The results show that social self-efficacy in the real world (offline) was negatively related with the degree of game addiction, whereas social self-efficacy in the virtual world (online) indicated a positive association. Social activities with parents are negatively associated with game addiction, although no relationship is found between gaming activities with parents and game addiction. Parental attitude toward gaming has a negative relationship with the addiction. Results and implications are discussed.

Introduction

Internet (or online) games comprise a popular entertainment activity among adolescents. About 73% of U.S. adolescents are reported to enjoy playing computer games,[1] and more than 90% of their counterparts in South Korea are estimated to play online games.[2] Given the popularity of Internet gaming, its excessive use (or that of computer/online games) has become a serious problem among adolescents, resulting in adverse effects on their social relationships and day-to-day living.[3–5]

Previous studies of Internet addiction have reported an association between such addiction and a lack of social relationships with family or friends.[4–8] Individual characteristics such as sex, age, grade point average (GPA), and the amount of time spent online have also been reported to be related with the degree of addiction.[7,9,10] In addition, self-efficacy or outcome expectancy has been applied in Internet addiction studies and has been shown to have a strong relationship to addiction.[11,12]

However, although social relationships and self-efficacy are associated with Internet (or game) addiction, only a few studies have considered the relationship between social self-efficacy and game addiction. Adolescents addicted to the Internet are reported to keep more intimate relationships with virtual space (online) friends than with real space (offline) ones.[13] In addition, the addiction group also shows a marked preference for social interactions in virtual space, which aggravates their social interactions in real space.[14,15] Thus it is clear that social self-efficacy in virtual and real space could have opposing influences on the degree of game addiction (i.e., positive or negative).

Even though social relationships with parents have been reported to be strongly associated with Internet addiction,[4,5,7,16,17] minimal research has tackled the relationship of gaming activities between parents and adolescents (e.g., playing games with parents and/or joining game-related events) to game addiction. The relationship between "gaming activities with parents" and game addiction could vary from that of "general (not-directly-game-related) activities with parents" (e.g., talking frequently with parents and/or engaging in activities with them outside the home) because the former is directly related to game use. Thus this study tests each effect by dividing social relationship with parents into two categories: "gaming activities with parents" and "general activities with parents."

The study reported here was carried out to investigate whether social self-efficacy in both real (offline) and virtual (online) space are related with the degree of game addiction among young people. We also tested the relationships of social

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activities with parents, friends, and teachers and such personal factors as GPA and the amount of time spent on gaming with such addiction. Also of interest was determining whether playing games with parents is associated with the degree of game addiction. This was tested by separating such (gaming) activities from general social activities engaged in with parents. We also investigated the relationships of adolescents' own attitudes toward gaming, as well as those of their parents, friends, and teachers, to game addiction. Correlation analysis and ANOVA tests were used to compare three levels (groups) of game addiction: non-addicts (NA), possible (mild or moderate) addicts (PA), and Internet addicts (IA).

Literature Review

Internet game addiction and related factors

Internet addiction is also referred to as "computer addiction,"[18] "technological addiction,"[19] and "Internet addictive disorder."[20] This type of addiction refers to excessive Internet use to the extent that social relationships and daily functions are affected. It is characterized by symptoms of withdrawal, tolerance, salience, and dependence.[7,21] Internet addiction has been approached in the same way that pathological problems such as "Pathological or Problematic Internet Use (PIU)," "Generalized Problematic Internet Use (GPIU)," and "Internet Behavior Dependence (IBD)" are viewed.[22–24]

Internet game addiction has been studied as an area of general Internet addiction that includes cyber sex, gambling, online chat, and game addiction. Based on the general concept of addiction, Internet game addiction is characterized by the strong possibility of physical, social, and psychological problems that manifest themselves in problematic symptoms such as losing the ability to control oneself in playing games, suffering from withdrawal symptoms when prevented from playing games, and/or becoming overly dependent on games.[7,25]

Many variables related to Internet addiction can be applied to Internet game addiction research. In a study on addictive disorders among Internet users, Young[8] addresses that online (Internet) games are one of the most addictive activities on the Internet. Recent Internet games (e.g., massively multiuser online games, social-network games) have provided not only game playing but also social interaction (or network) arenas such as chatting, item trading, and information exchanges.[25] By playing Internet games, thus, users could also indulge in social interactions.[26] For the adolescents, in particular, Internet game addiction comprises the most dominant portion in their Internet addiction (i.e., chatting and game addiction).[2,25]

Previous studies indicate that both personal and social factors are associated with Internet addiction. For example, research has found that people who are lacking in self-confidence and/or opportunities to engage in social activities are more vulnerable to Internet addiction. Griffiths[21] reported that the more isolated and depressed an individual becomes, the more he or she becomes immersed in the Internet. His study shows that male teenagers who lack self-confidence about their social life are particularly likely to have this tendency. Young[6] also pointed out that those who are severely limited in terms of social activities or who are excessively cautious or self-defensive may become addicted to the Internet (or games). This is because they pursue an alternative means of satisfying their unfulfilled psychological desires. Similarly, Davis et al.[23] reported PIU to be characterized by loneliness and/or a lack of sociability.

Studies on Internet gambling addiction have reported those most related to be young, unmarried males.[27] Excessive computer users are traditionally young, introverted, aim-oriented males who are skilled at handling computers.[7,9,10] Mitchell[28] reported that males are more game-oriented, and females more chat-oriented users. Additionally, given that Internet (or game) addiction has been associated with students' engagement in social activities and adaptation to school,[6,7] it is likely that those with a low GPA will exhibit a higher degree of game addiction than those who achieve better grades.

Young[8] also pointed out that accessibility affects users' level of immersion in the Internet. Accessibility refers to the degree of opportunity that individuals have to engage in Internet use or play games. It can be applied to the amount of time available to play games or the frequency with which such games are played. The greater the level of accessibility, the greater the likelihood that an individual will experience negative Internet addiction symptoms.[29] Thus the following hypotheses will be tested.

H1a: GPA is negatively associated with the degree of game addiction.

H1b: Daily gaming time is positively associated with the degree of game addiction.

Social self-efficacy and game addiction

Self-efficacy has attracted the attention of researchers since the validity and usefulness of Bandura's social cognitive theory in explaining addictive behavior were proved.[30,31] Self-efficacy, or efficacy expectation, is defined as "the conviction that one can successfully execute the behavior required to produce the outcomes."[32(p193)] Many studies have shown that individuals with a high degree of self-efficacy tend to dedicate themselves to tasks and secure high levels of achievement.[33–35]

Social self-efficacy involves self-conviction in forming or maintaining social relationships. Thus individuals with greater social self-efficacy are more likely to have and successfully maintain social relationships and are less likely to experience loneliness. Along the same lines, those who suffer from loneliness hold more negative perceptions about their competence in terms of sociability than those who do not.[25] Considering that loneliness is strongly correlated with addictive (both excessive and compulsive) Internet use,[36] social self-efficacy in real (offline) space can be expected to have a negative association with the degree of game addiction.

Additionally, online social self-efficacy seems to be negatively associated with offline social self-efficacy, and this negative relationship is particularly obvious among adolescents suffering from addiction. Adolescents addicted to the Internet have been reported to have more intimate online relationships than their less-addicted counterparts.[13] Addictive use of the Internet may counter loneliness or satisfy an unfulfilled desire for sociability.[6] In fact, loneliness in real space is reported to have a positive relationship with the amount of time spent online.[37] Thus Internet addicts are expected to exhibit a much higher degree of online than offline social self-efficacy. Based on the above discussion, we will test the following hypotheses.

H2a: Social self-efficacy in real space is negatively associated with the degree of game addiction.

H2b: Social self-efficacy in virtual space is positively associated with the degree of game addiction.

Social relationships and game addiction

Young and Rodgers[36] have reported that many Internet-dependent individuals are self-reliant and take part in few social activities. Those who are addicted to the Internet are reported to have problems in their social relationships at school, home, and work.[14] Such addiction in adolescents is strongly related to problematic relationships with family, friends, and teachers.[4–6] Because the family plays an important role in children's socialization and delinquency,[38,39] the parent–child relationship strongly affects both Internet and game addiction: a good relationship lessens the degree of addiction.[4] Children's socialization also primarily occurs in school, indicating that stronger student–teacher relations in school can be associated with fewer behavioral problems.[40] Thus the relationship between adolescents and their teachers could be associated with the degree of adolescents' game addiction.

In addition, peer groups also play a crucial role in adolescent behavior,[41,42] and thus relationships with friends may also be associated with a young person's degree of game addiction. Among Korean adolescents, these social relationships seem to be positively related to this type of addiction. According to the Korea Game Industry Agency,[2] about 9 out of 10 Korean adolescents currently play games, with more than 80% enjoying primarily online games. It is not unusual for the country's young people to play games when they meet their friends in real space or to meet them in virtual space to take part in online games together. The overall popularity of online games among adolescents in Korea explains the probability of a positive association between social relationships with friends and the degree of game addiction. We will test the following hypotheses:

H3a: The level of social activities with parents is negatively associated with the degree of game addiction.

H3b: The level of social activities with teachers is negatively associated with the degree of game addiction.

H3c: The level of social activities with friends is positively associated with the degree of game addiction.

Gaming activities, attitudes, and game addiction

Along with general social activities between parents and children, gaming activities (i.e., co-playing games or joining gaming events) could also be closely associated with the degree of game addiction. Studies on adolescents and media effects have emphasized parents' roles in mediating the negative effects of television viewing.[43,44] Among the parental mediations, co-viewing TV with children is one of the crucial mediations associated with the negative effects of children's TV viewing.[44] Thus game-related activities as a parental mediation could be closely associated with the negative effects of gaming (i.e., game addiction). Besides, considering that "gaming activities with parents" are directly related with game playing, such activities could be strongly associated with game addiction. However, there is little research about the relationship of these co-activities with game addiction. This study seeks to test this relationship directly.

Additionally, we test whether parental attitudes toward the use of games are associated with the degree of addiction. Parents play a crucial role in determining adolescent behavior.[38] A parent's belief or attitude toward specific activities could strongly influence their children's behaviors. Thus it seems quite natural to assume that parents' attitudes toward gaming are related to their adolescent children's gaming behavior. However, very little has been reported on the relationship between parental attitudes toward game use and Internet game addiction among adolescents. In addition, teachers and friends serve as significant others in the daily lives of adolescents. Accordingly, adolescent game addiction is potentially related to teachers and friends' attitudes toward gaming. However, again, there have been few studies about the relationship of game addiction and attitudes of friends and teachers. The study reported here also directly tested for these relationships. Thus, based on the foregoing discussion, this study set out to test the following hypotheses and research questions.

H4a: Gaming activities with parents is negatively associated with game addiction.

H4b: Parental attitude toward gaming is negatively associated with the degree of game addiction.

H4c: Teachers' attitude toward gaming is negatively associated with the degree of game addiction.

H4d: Friends' attitude toward gaming is positively associated with the degree of game addiction.

Finally, we investigate further the relationships of variables regarding self-efficacy, social activities, and attitudes with game addiction by dividing the participants into three groups based on their level of game addiction. This test is intended to determine how different the mean of these variables is across the groups. This further analysis will provide more details in ascertaining the relationships between these variables and game addiction. The relevant research question is as follows:

RQ1: Do groups at variance in their levels of game addiction (i.e., NA, PA, and IA) significantly differ from each other in terms of self-efficacy, social activities, and attitudes?

Method

Survey design and analysis

A total of 600 students from six schools (three middle and three high schools) in Seoul, South Korea, were surveyed. The schools were randomly selected from a list of 592 city schools (356 middle, 236 high schools). Among the three middle schools (29 classes in total), we randomly selected eight classes. Also, six high-school classes were selected among the three high schools (34 classes in total). Among the 600 participants, half were high-school students aged between 15 and 18 years, and the other half were middle-school students aged between 12 and 15 years. Just over half

of the students were male (319, 53.2%). All participants received 5,000 KRW (about 5 USD) for their involvement in the survey.

The hypotheses were tested in two ways. The first way was used to determine correlations between the degree of game addiction and other variables: personal characteristics such as GPA (six levels) and daily number of hours spent playing games; social self-efficacy in real space (offline) and virtual space (online); social activities with parents (general and gaming), friends, and teachers (frequency with which the participants engaged in dialogue and outside activities); and attitudes toward gaming (adolescent's own attitude and those of his or her parents, friends, and teachers).

After finding variables significantly correlated with game addiction, we used ANOVA tests comparing the mean values of the significantly related variables. For the tests, we divided the participants into three groups based on their levels of game addiction using Young's Internet Scale, which classifies participants into three groups: non-addicts (NA), possible (mild or moderate) addicts (PA), and Internet addicts (IA). In the Internet Addiction Test (IAT) at the Center for Internet Addiction (www.netaddiction.com), Young suggested three cut-off points for the three groups: average online users (NA), 20–49; users experiencing occasional problems (PA), 50–79; and those experiencing significant problems (IA), 80–100. The suggested cut-off points have been applied to many of recent Internet addiction studies.[45,46]

Measures

Degree of game addiction. Young[6,8] created a detailed 20-item, 5-point Likert scale based on the pathological gambling addiction criteria of the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV) to estimate the degree of Internet addiction. The DSM-IV is published by the American Psychiatric Association and covers all mental disorders for both adults and children. We revised Young's IAT to measure the individual degree of game addiction by adding "gaming" to the questions (e.g., Do you fear that life without Internet [gaming] would be boring? Do you try to hide how long you've been online [gaming]?) The total scores ranged from 20 to 100 ($\alpha = 0.93$).

Social self-efficacy. A 4-item measure of social self-efficacy in real space was created by modifying the social self-efficacy scales of the Self-Efficacy Questionnaire for Children (SEQ-C)[47] and the Self-Efficacy Scale.[48] Items include: (1) I can easily become friends with other children; (2) I have difficulty expressing my opinions when my classmates disagree with me; (3) It is easy for me to chat with people I am unfamiliar with; and (4) I rarely meet other people ($\alpha = 0.69$). A similar 4-item scale was used to measure social self-efficacy in online games, with the modified items including: (1) I can easily become friends with other online game users; (2) I often participate in online game communities; (3) I love to meet unfamiliar people while playing online games; and (4) It is not important for me to meet other people during online games ($\alpha = 0.69$).

Social activities with parents. We asked the participants about the frequency with which they talked to or took part in activities outside the home (e.g., sightseeing, watching movies, eating at restaurants, visiting sports complexes or gymnasiums) with their parents. They were asked to answer on a 6-point scale where 1 = "never" and 6 = "very often" ($\alpha = 0.69$).

Gaming activities with parents. The participants were asked for details of how often they played games with their parents, how often their parents recommended games to them, how often their parents purchased game titles for them, and how often they participated in gaming expos or camps with their parents ($\alpha = 0.89$).

Social activities with friends/teachers. This measure considered the frequency with which the participants talked with their friends about school work or games, as well as how often they played games with their friends and recommended game titles to one another ($\alpha = 0.81$). The same questions were asked about how often they engaged in such social activities with their teachers ($\alpha = 0.85$).

Attitudes toward gaming. We measured the participants' attitudes toward gaming by asking them to answer the question "How do you feel about playing games?" using two 5-point scales ranging from 1 = "very bad/very useless" to 5 = "very good/very useful" ($\alpha = 0.95$). We also asked the participants' parents ($\alpha = 0.90$) and teachers ($\alpha = 0.89$) about their attitudes toward gaming, although the participants themselves were asked about their own ($\alpha = 0.95$) and their friends' attitudes ($\alpha = 0.91$).

Results

The average amount of time the adolescent participants spent playing games each day was about 68 minutes ($SD = 49.81$), with boys playing for 75.28 minutes ($SD = 53.77$) a day and girls for 59.27 minutes ($SD = 43.51$; $t = 3.90$, $p < 0.001$), and middle-school students for 71.48 ($SD = 54.77$) minutes and high-school students for 64.37 minutes ($SD = 44.11$). The average level of social activity engaged in with parents was 4.56 ($SD = 1.19$), and that of gaming specifically was 1.67 ($SD = 0.98$). The average score of parental attitudes toward gaming was 2.65 ($SD = 0.81$), and that for the participants' own attitudes was 3.45 ($SD = 0.77$); the average game addiction score was 55.36 ($SD = 14.02$). The average values of each of the variables are presented in Table 1.

In terms of grade level (middle and high school), high-school students' mean degree of game addiction ($M = 59.36$, $SD = 13.88$) was significantly higher than that of middle-school students ($M = 51.35$, $SD = 13.01$; $t = 7.30$, $p < 0.001$). Male students exhibited a higher mean level of game addiction ($M = 56.88$, $SD = 13.62$) than that of female students ($M = 53.63$, $SD = 14.30$; $t = 2.86$, $p < 0.01$).

Correlation analysis

To test the hypotheses, we employed a zero-order Pearson correlation analysis (see Table 2). The analysis was performed on two personal characteristics (GPA and daily gaming hours), two social self-efficacy (offline and online), two social activities with parents (general and gaming), social activities with friends and teachers, and attitudes toward gaming (own attitude, those parents, friends, and teachers).

Table 1. Variable Measures and Descriptive Statistics

	Measure	*Mean*	*S.D.*
Personal characteristics			
Sex	0 = Female; 1 = Male		
GPA (student's academic performance)	Down 90% ≤ 1 ≤ 100% 70% ≤ 2 < 90% 50% ≤ 3 < 70% 30% ≤ 4 < 50% 10% ≤ 5 < 30% 6 = Within Top 10%	4.27	0.94
Grade level	0 = Middle school 1 = High school		
Daily gaming time	Minutes	67.92	49.81
Social self-efficacy			
Offline self-efficacy (real space)	1–5 (low-high)	3.12	0.78
Online self-efficacy (virtual space)	1–5	2.74	0.79
Social activities			
General activities with parents	1–6 (low-high)	4.56	1.19
Gaming activities with parents	1–6	1.67	0.98
Social activities with friends	1–6	4.22	1.26
Social activities with teachers	1–6	2.48	1.09
Attitudes toward gaming			
Adolescents' own attitude	1–5 (low-high)	3.45	0.77
Parents' attitude	1–5	2.65	0.81
Friends' attitude	1–5	3.59	0.77
Teachers' attitude	1–5	2.54	0.83
Game addiction			
Degree of game addiction	20–100	55.36	14.02

General activities with parents means "not-directly-gaming-related" activities such as talking frequently with parents and engaging in activities with them outside the home.

Table 2. Correlations Between Variables

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1. GPA	1.00												
2. Daily gaming time (min)	−0.15***	1.00											
3. Offline Social Self-efficacy	−0.01	0.01	1.00										
4. Online Social Self-efficacy	−0.01	0.10*	−0.24***	1.00									
5. Social (general) Activities w/parents	0.03	−0.07	0.26***	−0.14***	1.00								
6. Gaming Activities w/parents	0.05	0.04	−0.04	0.21***	−0.02	1.00							
7. Social Activities w/friends	−0.07	0.19***	0.17***	0.09*	0.33***	0.12**	1.00						
8. Social Activities w/teachers	0.02	−0.03	−0.11**	0.20***	0.10*	0.36***	−0.05	1.00					
9. Adolescents' own attitude	0.02	0.02	−0.01	0.17***	0.10*	0.12**	0.33***	0.01	1.00				
10. Parents' Attitude	0.09*	−0.03	0.16***	−0.02	0.07	0.02	0.08*	−0.04	−0.01	1.00			
11. Friends' Attitude	0.03	0.04	0.07	0.09*	0.20***	0.09*	0.42***	−0.05	0.48***	0.06	1.00		
12. Teachers' Attitude	−0.06	−0.03	−0.17***	0.09*	−0.11**	0.13**	−0.06	0.09*	0.06	0.08*	−0.01	1.00	
13. Game addiction	−0.12**	0.10*	−0.51***	0.52***	−0.24***	0.04	0.06	0.08	0.25***	−0.13***	0.06	0.11**	1.00

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

The results identified significant relationships between social self-efficacy and game addiction. Online social self-efficacy showed a positively significant association with game addiction ($r = 0.52$, $p < 0.001$), while offline social self-efficacy exhibited a negatively significant relationship with game addiction ($r = -0.51$, $p < 0.001$). Thus H2a and H2b were supported.

Regarding the relationships between social activities and game addiction, general social activities had a negatively significant association ($r = -0.24$, $p < 0.001$). However, we could not find any significant relationships between social activities with friends and game addiction. Likewise, social activities with teachers showed no significant association with game addiction. Thus H3b and H3c were not supported, while H3a was supported.

The relationship between parents' attitude toward gaming and adolescents' game addiction was negatively associated ($r = -0.13$, $p < 0.001$). The adolescents' own attitude showed a significant relationship with game addiction ($r = 0.25$, $p < 0.001$), while friends' attitude was not. Interestingly, teachers' attitude were also positively correlated with the addiction ($r = 0.11$, $p < 0.01$). Finally, gaming activities with parents did not show any significant correlation with game addiction. Thus H4a, H4c, and H4d were not supported, while H4b was supported.

Regarding variables pertaining to personal characteristics, GPA was negatively correlated with game addiction ($r = -0.12$, $p < 0.01$), while gaming time was positively associated ($r = 0.10$, $p < 0.05$). Thus both H1a and H1b were supported.

ANOVA tests

With the significant variables in the correlation analysis, we performed ANOVA tests to see the differences among the three groups in terms of the degree of game addiction: non-addicts (NA, $n = 193$, 32.2%), possible (mild or moderate) addicts (PA, $n = 394$, 65.6%), and Internet addicts (IA, $n = 13$, 2.2%). Post hoc tests (Sheffe) were used for the groups' multiple comparisons (see Table 3).

Offline social self-efficacy revealed significant differences among the groups, $F(2, 597) = 63.17$, $p < 0.001$. NA group's mean value ($M = 3.58$, $SD = 0.73$) was significantly higher than those of the other groups (PA, $M = 2.92$, $SD = 0.69$; IA, $M = 2.35$, $SD = 0.76$); IA group's mean compared to PA group's was also significantly lower. These results strongly verify the negative relationship between social self-efficacy in the real world and the degree of game addiction. A significant difference was also noted among the groups in online social self-efficacy, $F(2, 597) = 62.34$, $p < 0.001$. Contrary to offline social self-efficacy, the IA group showed the highest scores in online social self-efficacy, and IA's score ($M = 3.46$, $SD = 0.70$) was significantly higher than those of NA ($M = 2.27$, $SD = 0.81$) and PA ($M = 2.95$, $SD = 0.67$). This also corroborates its positive association with game addiction.

General activities with parents also manifested significant differences among the groups, $F(2, 597) = 19.51$, $p < 0.001$. The substantive difference in the values was found between the NA group ($M = 4.99$, $SD = 1.21$) and the PA group ($M = 4.36$, $SD = 1.14$), and between the NA and IA groups ($M = 4.15$, $SD = 0.77$). There was no significant difference between the PA group and IA group, which implies that parents whose adolescents are not addicted to games have much more social activities with their children than those of mild and serious addicts. Likewise, a similar pattern was found in daily gaming time, $F(2, 597) = 4.63$, $p < 0.01$: there was a significant difference between the NA group ($M = 59.03$, $SD = 44.28$) and the PA group ($M = 72.01$, $SD = 51.73$).

We also found significant differences among the groups in the adolescents' own attitude, $F(2, 597) = 16.77$, $p < 0.001$. Interestingly, the adolescents' own attitude did not show any difference between the NA group ($M = 3.32$, $SD = 0.71$) and the PA group ($M = 3.47$, $SD = 0.76$); the difference was found between the PA and IA groups ($M = 4.54$, $SD = 0.76$). GPA showed a similar pattern, $F(2, 597) = 7.23$, $p < 0.001$: the scores were significantly different between the PA group ($M = 4.24$, $SD = 0.94$) and the IA group ($M = 3.38$, $SD = 0.77$).

Parents' attitudes toward gaming revealed significant differences among the three groups, $F(2, 597) = 8.76$, $p < 0.001$. The more addicted the groups of adolescents were, the worse their parents' attitude toward gaming was. However, although teachers' attitudes were significantly correlated with game addiction, there was no difference among the three groups in the attitude scores.

Discussion

The results of this study provide empirical evidence that social activities with parents are negatively related with the degree of game addiction among adolescents. Social activities

Table 3. ANOVA Test Results

	NA (None)	*PA (Possible)*	*IA (Addicts)*	*F-value*
Degree of game addiction	38.62 (7.16)	62.66 (7.66)†	82.54 (3.71)††	763.52***
Offline social self-efficacy	3.58 (0.73)	2.92 (0.69)†	2.35 (0.76)††	63.17***
Online social self-efficacy	2.27 (0.81)	2.95 (0.67)†	3.46 (0.70)††	62.34***
Social (general) activities with parents	4.99 (1.21)	4.36 (1.14)†	4.15 (0.77)	19.51***
Adolescents' own attitude	3.32 (0.71)	3.47 (0.76)	4.54 (0.76)††	16.77***
Parents' attitude	2.79 (75)	2.61 (0.82)†	1.92 (0.65)††	8.76***
Teachers' attitude	2.48 (0.79)	2.56 (0.83)	3.00 (1.08)	2.71
GPA	4.37 (0.91)	4.24 (0.94)	3.38 (0.77)††	7.23***
Daily gaming time	59.03 (44.28)	72.01 (51.73)†	76.15 (54.24)	4.63**
N	193 (32.2%)	394 (65.6%)	13 (2.2%)	

Notes. †Significantly different from the prior group (NA vs. PA); ††significantly different from the other groups. NA, non-addicts; PA, possible (mild or moderate) addicts; JA, Internet addicts. Numbers in parentheses are standard deviations. **$p < 0.01$, ***$p < 0.001$.

are particularly important to this age group because their relationships with parents, friends, and teachers play a part in their formation of a self-concept/self-identity. This study shows that, of these three relationships, the one with parents is most important when it comes to the degree of game addiction among young people. This finding is in line with the results of previous studies stressing that a good parent–child relationship is negatively related to Internet addiction.[4,5,7,16,17]

Online and offline social self-efficacy are also found in this study to have opposite results in relation with game addiction, with the two strongly negatively correlated ($r = -0.24$, $p < 0.001$). Adolescents who feel more intense loneliness and spend less time engaged in social relationships in real space exhibit a lower level of offline social self-efficacy than those who feel less lonely. However, these adolescents exhibit a much higher degree of social self-efficacy in online space, as they are more comfortable satisfying their need for companionship in cyberspace. They are more vulnerable to game addiction, with a high correlation between online social self-efficacy and game addiction ($r = 0.52$, $p < 0.001$). When it comes to the relationship between daily gaming time and online social self-efficacy ($r = 0.10$, $p < 0.05$), it seems obvious that those who have a higher degree of online social self-efficacy could be much more inclined to be addicted to online games.

The results above confirm that parents' activities with their children play a crucial role in game addiction. General activities with parents are directly and negatively correlated with game addiction, while other social activities (e.g., with friends and teachers) are not significantly associated with the addiction. In addition, such activities are positively related with offline social self-efficacy ($r = 0.26$, $p < 0.001$) and negatively related with online social self-efficacy ($r = -0.14$, $p < 0.001$). These associations imply that parents' activities with their children could be effective in reducing or preventing game addiction.

Interestingly, contrary to our expectation, gaming with parents is not significantly related with game addiction. Considering that parents' mediation into media use (e.g., TV) could positively influence their children's media use,[44] gaming with children could be one of the proactive mediations by parents in preventing their children from the negative effects of gaming. However, this study shows no significant relationship with game addiction. This result is partly because of the low average of co-playing with parents among the subjects ($M = 1.67$, $SD = 0.98$): about 80% of adolescents have not played games with their parents. Future studies should address this issue using different methods such as controlled experiments and observations in specific groups.

Adolescents' own attitudes toward gaming do not exhibit any difference between the NA and PA groups. Suppose an adolescent user develops from the NA to the PA group in the degree of game addiction, the adolescent's daily gaming time could be rapidly increased (from 59.03 to 72.01 minutes) and the social (general) activities with parents could be rapidly diminished (from 4.99 to 4.36 minutes). However, even though the degree of game addiction is significantly different between the two groups (NA, $M = 38.62$, $SD = 7.16$; PA, $M = 62.66$, $SD = 7.66$), his/her own attitude toward gaming could show no difference, as in GPA and teachers' attitude. The relationship with parents and parents' attitudes, on the other hand, could show substantive differences from the development.

There is a significant difference in adolescents' attitudes between the PA and IA groups (PA, $M = 3.47$, $SD = 0.76$; IA, $M = 4.54$, $SD = 0.76$). Likewise, the IA group shows a substantively lower score in GPA than that of the PA group (PA, $M = 4.24$, $SD = 0.94$; IA, $M = 3.38$, $SD = 0.77$). Parents' attitudes toward gaming also show a significant difference between the two groups (PA, $M = 2.61$, $SD = 0.82$; IA, $M = 1.92$, $SD = 0.65$). We need to note that the adolescents' attitude score is significantly higher in the IA group than the PA group; on the contrary, the parents' attitude score is substantively lower in the IA group than the PA group. Thus the attitude difference between parents and adolescents is highest in the IA group, which may cause serious troubles between parents and adolescents and consequently worsen the adolescents' degree of game addiction.

In contrast, co-activities between adolescents and parents seem to be much fruitful in the PA group. The first sign of game addiction can be the rapid increase in gaming time along with the withdrawal of social activities with parents in the PA group. However, adolescents' own attitudes do not yield any difference between the NA and PA groups, which is the same case for GPA and attitudes of teachers and friends. On the other hand, parents' attitudes are significantly different, and this appears to be associated with the differences in co-activity time and adolescents' gaming time between the two groups. Considering the negative association between offline social self-efficacy and game addiction, parents' efforts to engage in more offline activities with their children in the PA group may prevent adolescents from the development of game addiction.

Teachers' attitudes toward gaming, which are positively correlated with adolescents' game addiction, plus the absence of a significant difference among the three groups in terms of teachers' attitude scores were puzzling. However, the absence of a significant difference among the three groups in teachers' attitude scores may be due to the relatively large standard deviation of the IA group's teachers' attitudes, that is, its polarized distribution between positive and negative distribution. We speculate that the positive correlation of teachers' attitudes toward gaming with students' game addiction may be attributed to their efforts in caring for students who exhibit problematic behaviors. Teachers may raise concerns that their negative attitude prompts students to keep their distance from them. This will make their monitoring work on the students more difficult.

In closing, we would like to provide suggestions for future studies. First, data should be gathered from additional countries. An important limitation of the current study is that its data were gathered only in South Korea, one of the most "wired" countries in the world, with more than 90% of teens playing Internet games and experiencing no difficulties in gaining Internet access, and about 98% of adolescent online gamers playing primarily PC-based online games.[2] Future studies should thus be carried out to compare the relationships of various factors with game addiction in countries with different Internet-use environments. The associations of different types of online games with game addiction, such as PC- and console-based online games, could also be investigated. Second, additional self-efficacy variables could be included in future studies to determine their relationships with game addiction and with one another. The study reported here assessed the associations

of game addiction with social self-efficacy in both real (offline) and virtual (online) space. However, other self-efficacy variables, such as computer, gaming, and general self-efficacy, could be incorporated to explore further their relationships with game addiction.

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