

**Psychosocial risk factors associated with
Internet addiction in Korea**

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- ABSTRACT-

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Objectives: The aim of this study was to examine the prevalence of Internet addiction in middle school students and to identify associated psychosocial risk factors and depression. .

Methods: This study was part of a larger epidemiological study on childhood psychiatric disorders conducted in Osan, a city of Republic of Korea. We used IAS for internet addiction, K-YSR for subjects' emotional and behavioral problems and K-CDI for depressive symptoms. We used the data of N=1217 completed cases. We put on independent variables, which are sex, age, smoking and alcohol experiences, economic status, age of first Internet use, K-YSR and K-CDI score.

Results: The subjects consisted of addicted users (2.38%), over users (36.89%) and normal Internet users (60.72%). Attention problems, sex, delinquent problems, K-CDI scores, thought problems, age and aggressive behavior were predictable variables of internet addiction. Age of initial Internet use negatively predicted Internet addiction.

Conclusion: This result showed similar to other researches about sociodemographic, emotional or behavioral factors related to internet addiction. Generally, subjects with more severe internet addiction had more emotional or behavioral problems. It means that they already have had various difficulties when we found internet addiction of adolescents. Therefore it is necessary to evaluate whether the subjects have any emotional or behavioral troubles and to intervene to prevent internet addiction.

Keywords: Internet addiction, adolescent, K-YSR, K-CDI, age of initial internet use



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I. INTRODUCTION

South Korea has one of the most advanced IT systems in the world, with a fast internet speed and overall nationwide easy internet accessibility. Therefore, the adaptation of internet use in their lives has become a common phenomenon. A survey on the use internet revealed that 99.9% of adolescents(National Information Society Agency, 2012). Internet addiction has been recognized as an international problem. Studies in other countries have also been conducted. The prevalence rate of internet addiction in the USA is 9.8~15.2% among people in their teens and twenties(Megen A., 2011). In Greece, prevalence rate of potential problematic internet use (PIU) is 19.4% and the PIU rate is 1.5%. In this study, potential PIU is defined as internet use which fulfils some, but not all, of the propose criteria of PIU. They used Young Internet Addiction Test for grouping internet use characteristics. PIU means an individual's inability to control one's use of the internet, so have marked distress and/or functional impairment. In Taiwan, the prevalence rate of the internet addiction is 15.3% among university students(Lin MP et al., 2011). A number of studies have revealed the incidence rates of Internet addiction among Korean adolescents to be between 2.6 and 14.9%(National Information Society Agency, 2012; National Internet Development Agency of Korea, 2006; National Internet Development Agency, 2006). A number of factors such as location, screening tool and target age may have contributed to the differences of incidence rates in these studies.

Internet addiction disorder (IAD) is defined as one's inability to control his use of the internet, which could leads up to physical, psychological, social difficulties(Young KS,

1998). In 1998, Goldberg suggested IAD to be a psychiatric disorder based on pathological gambling as described in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). Along with pathological gambling, IAD show features similar to those of substance dependency like salience, mood modification, tolerance, withdrawal symptoms, conflict and relapse(Young KS, 1998). Clinical concern requiring intensive evaluation and treatment on Internet addiction has magnified over the past few years. But it was debated whether it should be added as a disorder in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V). It is not clear whether internet addiction has manifested from a preexisting disorder, or is truly a discrete disease entity. As of 2013, 'Internet use gaming disorder' has been incorporated into DSM-V Section 3, a category of disorders needing further research(American Psychiatric Association, 2013).

Internet addiction has demonstrated a correlation with depression, attention-deficit hyperactivity disorder (ADHD) and impulse control disorder(Yen JY et al., 2009; Cao F et al., 2007; Yen CF et al., 2009; Lam LT et al., 2010). Of the 1618 students aged 13 to 18 years, 6.4% were at a moderate to high risk of pathological internet use. Those with pathological use were 2.5 times more likely to experience depression at the 9-month follow-up compared with the control group. This result suggests that young people who are initially free of mental health problems but pathologically use the internet are at risk of developing depression(Lam LT, 2010). On the other hand, depression was one of the preceding mental health issues of Internet addiction as reported by Young(Young KS, 1998).

The development of internet addiction was shown to be higher in the population with ADHD. In a report by Yoo et al., it was stated that elementary students with internet

addiction had a higher rate of ADHD symptoms(Yoo HJ et al., 2004). The adolescent population has also shown an associations between ADHD and internet addiction(Ju SJ et al., 2011). It is suggested that to satisfy their need for immediate gratification, child and adolescents with ADHD seek comfort in the internet probably leading to internet addiction. Because they have a harder time to retain their interest and have an aversion for delayed reward, this usually results in poor academic function and difficulties in peer relationships. This is probably one of the main causes of their internet addiction because internet activities usually provide multimodal stimuli, immediate response and reward.

In addition, exposure to the internet at an early age and poor family cohesion, adaptability and communication were environmental factors of internet addiction(Ju SJ et al., 2011). Ni X. et al. stated that the age of first exposure to internet use was significantly associated with internet addiction(Ni X. et al., 2009). Surveys on other addictions such as pathologic gambling and alcohol drinking suggest that early age exposure is closely related to its severity or dependency(Buchmann AF et al., 2009; Jenkins MB et al., 2011; Rahman AS et al., 2012). If we take into account the results of these researches, exposure to the internet at a young age may be an associated factor to Internet addiction.

In this study, our aim was to examine 1) the prevalence of problematic internet use and the extent of internet addiction, 2) the factors associated with internet addiction.

II. METHODS

A. SUBJECTS

This study was a part of a larger epidemiological study on child psychiatric disorders conducted in Osan, a city southwest of Seoul, Republic of Korea. The Child Mental Health Care Center performed the survey during a periodic health examination of local children, collecting the data in 2006. The investigators explained to students, and their parents about objects of this study and benefits by letters and they signed the informed consents, and gave assurance of confidentiality. The students were requested to complete the questionnaires in a classroom under supervision of a research assistant. Total 1857 students participated in this research and 640 students were excluded due to incomplete questionnaires, resulting in 1217 students.

B. MEASUREMENTS

1. Sociodemographic data

The participants completed a general questionnaire covering family structure, parental education and economic status, smoking experience, alcohol drinking experience and age of initial Internet use as well as age and sex. Economic status was divided into three categories based on family income.

2. Internet Addiction Scale, IAS

The degree to which the subject is involved in Internet usage was determined using the Korean version of the Internet Addiction Scale (IAS)(Young KS,1998; Yoo HJ et al, 2004). The IAS consists of 20 questionnaire items. Each item is rated on a 5-point scale; a higher overall score indicates greater Internet addiction. According to Young, a score of 70 or above in the IAS indicates apparent Internet addiction, and a score over 40 indicates overuse of the Internet, which may cause some problems in daily life. The IAS has been established as a reliable and valid tool(Shapira NA et al, 2000). Cronbach's alpha was 0.91 in the present study, indicating excellent internal consistency.

3. Korean-Youth Self Report, K-YSR

Achenabch (1991) developed this self-report scale (YSR) which adolescents use for self-reporting their own adaptability and emotional and behavioural problems for the last 6 months(Achenbach T, 1991). It was developed for adolescents between the ages of 11 and 18 years. The YSR yields age and gender-based T-scores for 13 empirically derived subscales, such as anxious/depressed, attention problems, aggressive behaviours, externalizing and internalizing problems, etc. The YSR has been reported to have adequate psychometric

properties. We used the Korean version of YSR that was devised by Oh et al. that is considered to have similar adequate psychometric properties in Korean adolescents(Oh KJ et. al, 1997). K-YSR has also been normed for gender- and age-specific groups and has been used widely for clinical and research purposes in Korea.

4. Korean Children's Depression Inventory, K-CDI

We used the CDI to assess depressive symptoms. The CDI consists of 27 self-rated questions scored on a 3-point Likert scale from 0 (*not present*) to 2 (*present and marked*); the total score range is from 0 to 54(Kovacs M et al, 1977; Kovacs M, 1983). The item domains include negative mood, interpersonal problems, negative self-esteem, ineffectiveness, and anhedonia(Kovacs M et al, 1977; Kovacs M, 1983). The Korean version of the CDI was standardized in 1990, and its validity and reliability in Korean samples have been well established and reported elsewhere. A total score of 29 is considered the cutoff point for severe depressive symptoms in the K-CDI(Cho SC et. al, 1990).

5. Statistical Analysis

First, we separated the subjects into three groups—Internet addicted users, overusers and normal Internet users—based on the total scores on the IAS and compared sociodemographic characteristics and K-YSR scores among the three groups with a chi-square test and a Kruskal-Wallis test. We used this non-parametric method because this study did not show normal distribution.

Second, the primary purpose of the present study was to assess the effects of emotional and behavioral problems and other family or socio-economic conditions on the addictive usage of the Internet using stepwise multiple regressions. Our main independent variables were sex,

age, smoking and alcohol experience, economic status, age of first internet use, sub-items of the K-YSR and K-CDI scores. The dependent variables included the IAS score—Internet addicted users, overusers, and normal Internet users. We used SPSS ver. 17.0 for the analyses.



III. RESULTS

Among the 1217 middle school students enrolled in this study, it was proven that 29 subjects (2.38%) were internet addicted users, 449 subjects (36.89%) were overusers and 739 (60.72%) were normal internet users (Table 1). Sex, age, smoking experience and age of initial internet use differed among the subgroups but alcohol drinking and economic status showed little difference (Table 1).

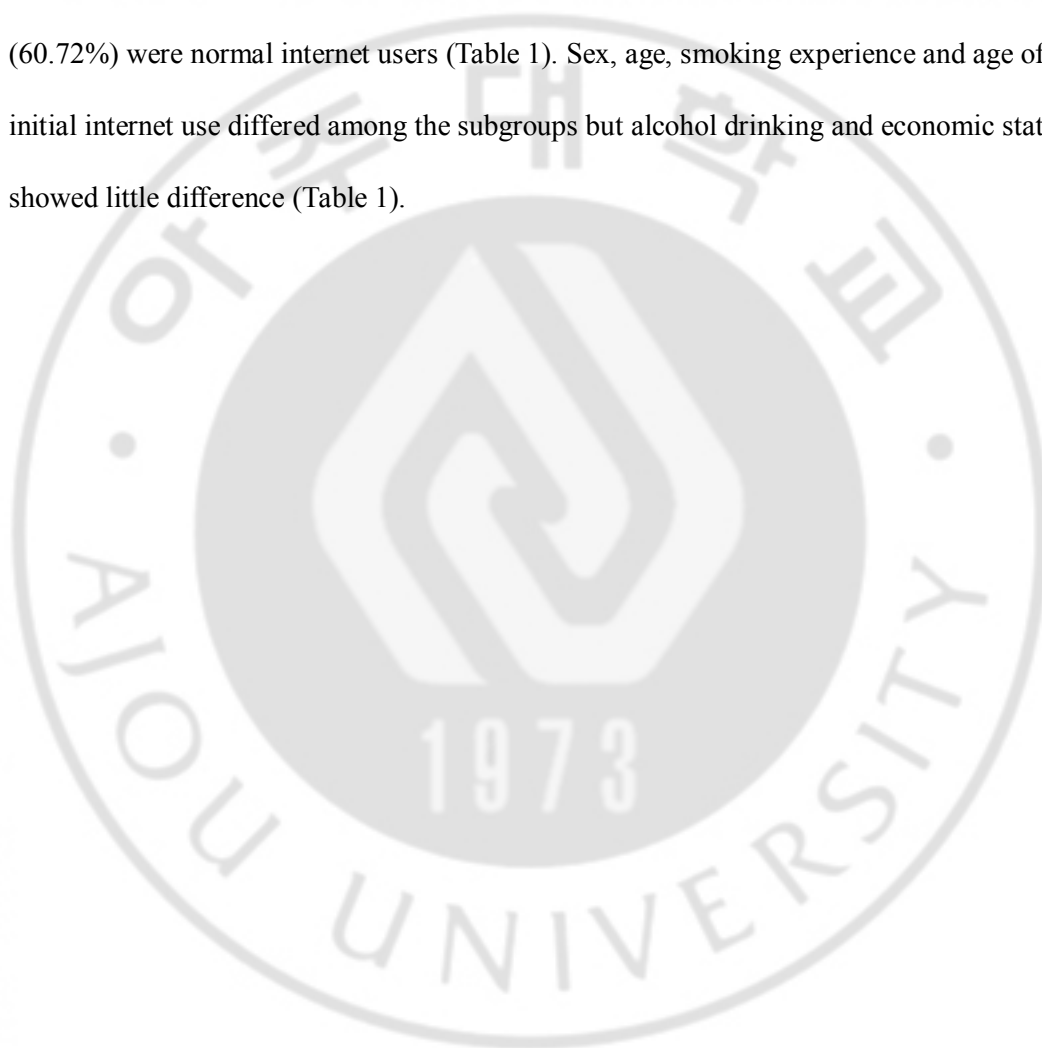


Table 1. Comparison of sociodemographic characteristics among addiction, overuser and normal user group

Variables (% within group)	Addiction (n=29)	Overuser (n=449)	Normal user (n=739)	P value
Sex				.000
Male	17	245	263	
Female	12	204	476	
Age				.018
13	9	145	297	
14	8	134	225	
15	12	170	217	
Smoking experience				.036
Yes	7	45	70	
No	22	404	669	
Alcohol drinking				.251
Yes	1	31	35	
No	28	418	704	
Economic status				.067
High	2	67	116	
Average	22	360	579	
Low	5	22	44	
Age of initial internet use (yrs)				.024

<8	3	34	37
8-10	17	253	374
≥11	9	162	328

The average scores were 77.41 ± 7.80 of internet addicted users, 49.42 ± 7.65 of overusers and 30.20 ± 5.13 of normal internet users (Table 2). In the higher internet addicted group, the score of sub-item of K-YSR was high and the differences were statistically significant ($p < 0.01$) except withdrawn item. There was no difference between overuser and internet addicted user but normal internet user showed a difference from the other two in the withdrawn item. In K-CDI, the higher internet addicted group showed a correlation with higher K-CDI scores and the difference among the three groups was significant ($p < 0.01$) (Table 2).

Table 2. Comparison of K-YSR / K-CDI scores among addiction, overuser, and normal user group

	Addiction (n=29)	Overuser (n=449)	Normal user (n=739)	χ^2
	(mean \pm SD)	(mean \pm SD)	(mean \pm SD)	
IAS score	77.41 \pm 7.80	49.42 \pm 7.65	30.20 \pm 5.13	883.40**
Total problem (YSR)	73.17 \pm 25.71	51.03 \pm 19.92	38.13 \pm 19.19	152.90**
Internalizing problems	24.21 \pm 11.77	16.50 \pm 8.64	12.23 \pm 8.30	101.73**
Withdrawn	5.38 \pm 2.51	4.38 \pm 2.61	3.15 \pm 2.39	80.48**
Somatic complaints	6.24 \pm 3.69	4.08 \pm 3.12	3.43 \pm 2.87	28.52**
Anxious/Depressed	13.59 \pm 7.49	8.61 \pm 5.09	6.02 \pm 4.82	112.35**
Social problems	4.34 \pm 2.61	3.21 \pm 2.17	2.23 \pm 1.95	82.64**
Thought problems	4.76 \pm 2.98	3.33 \pm 2.19	2.25 \pm 1.79	97.44**
Externalizing problems	21.07 \pm 7.14	14.33 \pm 6.23	11.25 \pm 5.80	106.14**
Attention problems	8.90 \pm 3.44	6.61 \pm 2.73	5.01 \pm 2.69	116.06**
Delinquent behavior	4.86 \pm 2.84	2.92 \pm 1.78	2.10 \pm 1.43	102.35**
Aggressive behavior	16.21 \pm 5.21	11.41 \pm 5.23	9.15 \pm 4.86	83.60**
K-CDI score	21.17 \pm 7.27	14.66 \pm 6.01	11.69 \pm 5.76	122.15**

**p<0.01. K-YSR: Korean-youth self report, K-CDI: Korean children's depression inventory, IAS:

internet addiction scale

Internet addiction was related to K-YSR total and sub-items and also to K-CDI (Table 3, $p < 0.01$). Factors that could explain the severity of internet addiction were attention problems ($\beta=0.578$, $t=3.36$), delinquent problems ($\beta=0.900$, $t=4.02$), thought problems ($\beta=0.727$, $t=3.80$) and aggressive behaviour ($\beta=0.264$, $t=3.25$) in K-YSR and sex ($\beta=5.498$, $t=8.65$), age ($\beta=1.591$, $t=4.29$), K-CDI scores ($\beta=0.382$, $t=6.50$) (Table 4). Age of first internet use showed counter correlation with internet addiction ($\beta= -0.090$, $t=-3.71$). It meant that when we start using internet younger age, we are easily addicted to internet (Table 4). Above eight items consisted of 31.5% of factors explaining internet addiction ($R^2=0.315$, $F(8)=68.41$, $p<0.01$) (Table 4).

Table 3. Correlation between K-YSR, K-CDI and IAS score

	Internet Addiction Scale	
	Boys	Girls
K-YSR		
Withdrawn	.303**	.365**
Somatic complaints	.250**	.268**
Anxious/Depressed	.347**	.455**
Social problems	.259**	.347**
Thought problems	.335**	.447**
Attention problems	.330**	.518**
Delinquent behavior	.357**	.390**
Aggressive behavior	.357**	.371**
Internalizing problems	.366**	.684**
Externalizing problems	.389**	.403**
Total problems	.447**	.656**
K-CDI score	.336**	.445**

**p<0.01. K-YSR: Korean-youth self report, K-CDI: Korean children's depression inventory, IAS: internet addiction scale

Table 4. Stepwise multiple regression analysis on internet addiction

Variables	R ²	Adjusted R ²	F	β	t
Attention problems	.315	.310	69.41**	.578	3.76**
Male				5.498	8.65**
Delinquent problems				.900	4.02**
K-CDI scores				.382	6.50**
Thought problems				.727	3.80**
Age				1.591	4.29**
Age of initial internet use				-.090	-3.71**
Aggressive behavior				.264	3.25**

IV. DISCUSSION

This study was about the internet addiction rate in middle school students and related socioeconomic characteristics, emotional and behavioural factors.

Males were more closely related to internet addiction than females which had consistent results with other studies(National Information Society Agency,2012; Lin MP et al., 2011; Yen JY et al., 2009; Cao F et al., 2007; Carli V et al., 2013). When multiple regression was conducted, the male gender was a strong predictor of internet addiction (Table 4).

This study proved there was a relationship between internet addiction and the older the subject were. Studies in other countries have also concluded that internet addiction is highly prevalent in adolescents(Cao H et al., 2011; Yen JY et al., 2007; Ko CH et al., 2009). But there has been no in-depth study into the reason why internet addiction affects adolescents between the ages of thirteen and fifteen. Generally, high school students are more likely to be addicted to the internet than middle and elementary school students. Therefore we speculate that as middle school students near high school age, their internet addiction becomes more prominent(National Internet Development Agency of Korea, 2008; Korea Agency for Digital Opportunity and promotion, 2008).

The younger the age of first internet use showed a higher tendency of a more severe internet addiction. A research in China on the starting age of internet use (age 8~12) in university freshman confirmed an internet addiction(Ni X et al., 2009). There is no definite reason but this result may mean that exposing children to the internet later in age could be a protective factor of internet addiction. To protect children from excessive internet exposure, the family environment is important. Parents have to enforce measurements on the internet

use of their children. Younger children are influenced easily by their parents' internet use.

Other family environmental factors also influence internet addiction. Kim et al. reported that communication problems within the family and a weak family cohesion were related to severe internet addiction(Kim HS et al., 2004). A survey showed that the atmosphere surroundings within the family would probably be an important factor in reducing internet addiction(Siomos K et al., 2012).

Internet addiction was correlated with a high K-CDI score and depression/anxiety and social problems: sub-items of K-YSR which was consistent with the results of other studies(Yen JY et al., 2007; Ko CH et al., 2009; Kim TH et al., 2005; Ko CH et al., 2012; Park MS et al., 2004; Lee MS et al., 2010). Based on Khantzian's hypothesis, we suggest that the cyber-world as a method of self medication can easily regulate the affection, self-esteem, relationship or self-care of the user even though they suffer from depression in the real world(Khantzian EJ, 1997). Lee et al. stated that those with severe internet addiction showed problems with adjusting to school life and low self-efficacy(Lee MS et al., 2010). Therefore, adolescents with depression or social problems are more likely to use the internet as a means of escaping problems in the real world.

Items associated with a social problem of K-YSR include not getting along, being teased and not liked, feeling persecuted, and being the target of fights and attacks.

The result that attention problem was a predicting factor with internet addiction was a replication of results of other studies(Yen JY et al., 2007; We JH et al., 2004; Yoo HJ et al., 2003). Ko et al. also reported that ADHD was the strongest predictor of internet addiction in a prospective study over two years(Ko CH et al., 2012). ADHD patients cannot endure one

thing for an extended period of time and they have difficulties waiting for delayed reward and only respond to immediate reward. So they become easily addicted to games that are immediately rewarding(Hong KE, 2005). Being able to multitask while on the internet is another attractive trait to ADHD patients.

In this study, delinquent problems, externalizing problems and aggressive behavior were associated with internet addiction (Table 2), moreover delinquent problems and aggressive behavior independently were predictors of internet addiction (Table 4). There are several researches which reported that impulsivity and delinquency are associated with internet addiction regardless of having an attention problem(Cao F et al., 2007; Carli V et al., 2013; Shin HS et al., 2004; Kormas G et al., 2011). Adolescents with aggressive or delinquent behavior have difficulties forming a relationship in the real world but find it easier to form and break in the cyber-world. But it is not clear whether aggression or delinquent behavior is a direct cause of internet addiction, more focus on this topic is needed.

Adolescent internet use could not be seen as a wasteful activity but as an indirect expression of difficulties associated with school adjustment and peer relationship. Internet addiction can be a sign of depression, anxiety or ADHD so the evaluation of comorbidity is needed. We have to also evaluate the severity of the internet addiction and its implication and give the internet addicts help.

This research has some limitations and the first limitation is geographical limitation because subjects were in a city in Korea, making it hard to generalize the results. The second limitation is that we couldn't explore more about correlation of depression, K-YSR sub-items or sociodemographic data with contents of internet use due to no data about the contents. It is

possible that correlations between them are associated with internet contents. The third limitation is about to thought problems of YSR. There has been no definite explanation about the relationship between thought problems and internet addiction yet. This study couldn't explain the association either. It could be a method like exploring about the contents of internet user to explain it. The third limitation is that problematic behaviors were not psychiatric disorders. So we cannot think that a person with high score in attention problems is an ADHD patient or a person with high delinquent problems is a patient with conduct disorder. The forth is that this study is cross-sectional study so we cannot explain exact causal relationship.

This result showed similar to other researches about sociodemographic, emotional or behavioral factors related to internet addiction. Male, older age, attention problems, delinquent problems, aggressive behavior, K-CDI scores and age of first internet use were related to internet addiction. Generally, subjects with more emotional or behavioral problems showed more severe internet addiction. It means that they already have had various difficulties when we found internet addiction of adolescents. Therefore it is necessary to evaluate whether the subjects have any emotional or behavioral troubles and to intervene to prevent internet addiction.

V. CONCLUSION

This result showed similar to other researches about sociodemographic, emotional or behavioral factors related to internet addiction. Male, older age, attention problems, delinquent problems, aggressive behavior, K-CDI scores and age of first internet use were related to internet addiction. Generally, subjects with more emotional or behavioral problems showed more severe internet addiction. It means that they already have had various difficulties when we found internet addiction of adolescents. Therefore it is necessary to evaluate whether the subjects have any emotional or behavioral troubles and to intervene to prevent internet addiction.

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한국 한 개 도시의 청소년 집단에서 인터넷 중독과 관련된

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연구 목적: 본 연구의 목적은 중학생들 중에서 인터넷 중독의 유병율을 알아보고 인터넷 중독과 연관된 심리 사회적 위험요소가 무엇인지 알아보는 것이었다.

연구 방법: 이 연구는 대한민국의 한 도시인 오산시에서 시행된 소아 청소년들의 정신과적 질환에 대해 실시한 대규모 역학 조사 자료의 일부였다. 우리는 인터넷 중독 정도를 알아보기 위하여 Internet Addiction Scale(IAS)를 사용하였고, 대상자들의 정서 행동 문제를 알아보기 위하여 한국 버전의 Youth Self Report(K-YSR)를 사용하였으며 우울 증상을 알아보기 위하여는 Children's Depression Inventory 의 한국 버전(K-CDI)을 이용하였다.

연구 결과: 조사 대상 중에 인터넷 중독 집단이 2.38%, 인터넷 과사용자 집단이 36.89%, 정상 인터넷 사용자 집단이 60.72%였다. 집중력 문제, 남학생, 비행 문제, 높은 K-CDI 점수, 사고 문제, 나이가 많은 것, 공격성 문제 등이 인터넷 중독의 예측 인자로 나타났다. 인터넷 시작 나이가 어릴 수록 인터넷 중독과의 연관성이 높았다.

결론: 이 연구는 인터넷 중독과 관련한 사회인구학적 요인, 정서 혹은 행동의 요인에 대한 다른 연구와 유사한 결과를 보였다. 일반적으로, 연구 대상자들 중에 더 심각한 인터넷 중독 경향을 보이는 경우에 정서 혹은 행동상의 문제가 많았다. 이는 청소년들 중에 인터넷 중독인 경우에는 이미 여러 가지 어려움을 많이 가지고 있었다는 것을 의미한다. 따라서 어떠한 정서 혹은 행동상의 어려움을 가지고 있는지에 대한 조사가 필요하며, 인터넷 중독을 예방하기 위한 개입이 필요하다.

핵심어: 인터넷 중독, 청소년, K-YSR, K-CDI, 인터넷 시작 나이