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## Prevalence and risk factors of Internet addiction in high school students

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**Aim:** In this study, the prevalence and risk factors of Internet addiction in high school students was investigated. **Material and Method:** This cross-sectional study was performed in the Mersin Province in 2012. The study sample consisted of students attending high school in the central district of Mersin. The data were summarized by descriptive statistics and compared by a binary logistic regression. **Results:** Our study population included 1156 students, among whom 609 (52.7%) were male. The mean age of the students was  $16.1 \pm 0.9$  years. Seventy-nine percent of the students had a computer at home, and 64.0% had a home Internet connection. In this study, 175 (15.1%) students were defined as Internet addicts. Whereas the addiction rate was 9.3% in girls, it was 20.4% in boys ( $P < 0.001$ ). In this study, Internet addiction was found to have an independent relationship with gender, grade level, having a hobby, duration of daily computer use, depression and negative self-perception. **Conclusion:** According to our study results, the prevalence of Internet addiction was high among high school students. We recommend preventing Internet addiction among adolescents by building a healthy living environment around them, controlling the computer and Internet use, promoting book reading and providing treatment to those with a psychological problem.

## Introduction

The advent of computers and the Internet has led to a series of dramatic changes and developments in the ways of generating, storing and sharing knowledge. Overuse of computers and the Internet creates physical, mental and social problems. Although it is not recognized as a standard definition, *Internet addiction* is defined as experiencing physical, mental and social problems because of Internet and computer overuse. Internet addiction has a negative impact on workplace relations, interaction with friends, academic life and family life. Internet addicts spend most of their life in front of the computer passing time with e-mails, chatting, discussion forums and online games. In a sense, we can say that Internet addicts move their social lives into the Internet

environment. Today, problematic Internet use and Internet addiction appear to be social issues that should be addressed without delay. In this regard, adolescents and young adults constitute the largest target group.<sup>1–5</sup>

A meta-analysis of Internet addiction has noted that high school students and young men are the high-risk groups.<sup>3</sup> In Taiwan, the prevalence of Internet addiction among high school students has been reported as 13.8%, with higher rates in men and students attending vocational schools.<sup>6</sup> However, another study in Taiwan showed the prevalence of Internet addiction in high school students as 20.1%.<sup>4</sup> In China, 2.4% of the adolescents were Internet addicts, and scores for comorbid disease and impulsivity scale scores are reported to be higher in students with Internet addiction.<sup>7</sup> In Korea, it was shown that 30% of the adolescents

were 'possible' Internet addicts, and 4.3% were Internet addicts; the prevalence of Internet addiction was 6.8% in male and 3.5% in female adolescents. Furthermore, in Korea, the students with Internet addiction were more frequently observed to have psychiatric issues such as somatization, obsessive compulsivity, depression, anxiety, hostility, phobic anxiety and psychosis.<sup>8</sup>

Such studies are also being performed and published in Turkey. Here the prevalence of Internet use has been shown to be higher in male than in female individuals, and the symptoms of psychiatric diseases have been shown to become more common with increasing duration of Internet use.<sup>9</sup> The prevalence of 'possible' Internet addiction has been noted to be 11.6% in high school students.<sup>10</sup> Thirty-one percent of Turkish students connected to the Internet at least once a day. Furthermore, the duration of Internet use among Turkish students has been noted to be higher in male individuals as well as in students at a moderate or high socioeconomic level, attending vocational schools or having low success at school.<sup>11</sup>

Both national and international studies suggest that Internet addiction is an important public health problem in adolescents and young people. In our country, there is a need to investigate the association of this issue with sociodemographic factors and psychiatric issues. In this study, we aimed to investigate the prevalence and risk factors of Internet addiction in high school students.

## Methods

This cross-sectional study was conducted between 12 March 2012 and 6 April 2012 in high schools located in the central district of Mersin. The students of those high schools constituted the study population. The study was conducted by the Department of Public Health, Faculty of Medicine, Mersin University, following receipt of official permission and approval of the ethics committee of the University.

### Sample size and selection

National and international studies report that the prevalence of Internet addiction in adolescents and high school students varies between 2.4 and 18.8%.<sup>4,6–8,10,12–16</sup> In total, 52 467 students attend 91 high schools in the central district of Mersin. The minimum sample size was calculated to be 850 students (10% prevalence, 95% confidence interval,  $\pm 2$  margin of error). Thus, we decided to include 1200 individuals in the study.

Twelve schools to be included in the study were selected in a randomized fashion. Although we had planned to enroll 9th, 10th, 11th and 12th graders, 12th graders could not be reached owing to their preparation for the Higher Education Examination. Therefore, 12th graders were excluded from the study and 1200 students were targeted to be included.

### Questionnaire

We used a structured questionnaire for the study. The questionnaire consisted of three sections to be completed by the participants.

First section: This included questions involving gender, age, grade level, smoking and alcohol consumption status, characteristics of the Internet and computer use and the educational and employment status of the parents.

Second section: The Internet addiction level of the students was evaluated by the Internet Addiction Scale, which is a valid and reliable assessment tool. The Internet Addiction Scale is a 27-item 5-point Likert-type evaluation tool that was first developed by Griffith<sup>17</sup> and adapted into Turkish by Canan *et al.*<sup>10</sup> The total score that can be gained from the scale ranges between 27 and 135. The adapted Turkish version used 81 as the cutoff point. Students who scored  $\geq 81$  were recognized as 'Internet addicts'.

Third section: The symptoms of the psychiatric diseases were determined by the Brief Symptom Inventory (BSI) scale. The validity and reliability of the BSI scale was tested by Sahin and Durak.<sup>18</sup> High scores indicate the presence of psychiatric symptoms in the related subgroup.

A pilot study of the questionnaire was tested on 30 students in a high school that had not been included in the study group. After this pilot study, the items that were not clearly understood by the students were revised and corrected.

### Data collection

The classes from the selected high schools were chosen in a randomized fashion. The students were given parental consent forms, and the students whose parents signed the parental consent form were enrolled in the study on the following day. The teachers were kept away from the class and the investigators were present while the students completed the questionnaires.

A total of 1215 students received consent forms in the study. As 47 parents did not give consent, our study included 1168 students. During the transfer of the questionnaires into the computer for analysis, 12 students whose questionnaires had substantial missing data were excluded from the study. Eventually, questionnaires from 1156 students were included in the study and analyzed. In all, 389 (33.7%) were 9th graders, 371 (32.0%) were 10th graders and 396 (34.3%) were 11th graders.

### Data analysis

The data were summarized by descriptive statistics. The chi-squared test and the linear-by-linear model were used for the comparison of categorical variables; the Mann–Whitney U test was used for the comparison of numerical variables; Pearson correlation coefficient was used for the comparison of two numerical variables and binary logistic regression was used for determination of risk factors for Internet addiction. Independent variables exhibiting a statistically significant correlation with Internet addiction in the univariate analyses were included in the model.

## Results

In total, 1156 students, 609 (52.7%) male and 547 (47.3%) female, were included in the study. The mean age of the study population was  $16.1 \pm 0.9$  years. Nine hundred thirteen (79.0%) of the students had a computer at home, 444 (38.4%) of those had their own computer, and 740 (64.0%) had Internet access at home. The percentage of students with at least one e-mail or social network account was 88.6 and 90.5%, respectively. Computers and the Internet were reported to be used for education/homework/research purposes by 918 (81.5%) students and for communication and social networking by 761 (67.6%) students (table 1).

One hundred seventy-five (15.1%) of the students were classified as Internet addicts. The prevalence was 9.3% in female and as high as 20.4% in male individuals ( $P < 0.001$ ). The prevalences of Internet addiction were 18.0, 17.3 and 10.4% for grade 9, 10 and 11 students, respectively; the prevalence of Internet addiction was observed to show a decremental trend from lower- to higher-grade students, and this relationship was statistically significant (linear-by-linear test,  $P < 0.01$ ). The analysis focusing on the relationship of Internet addiction with subgroups of gender and grade level revealed that there was no statistically significant correlation between Internet addiction and grade level in male individuals ( $P > 0.05$ ), whereas Internet addiction was found to be higher in ninth-grade students than in other students among female individuals, and this difference was statistically significant ( $P < 0.05$ ). Similarly, the comparison of students relative to grade level showed that Internet addiction was higher in male than in female individuals in all grades (9th grade,  $P < 0.05$ ; 10th grade,  $P < 0.001$ ; 11th grade,  $P < 0.01$ ) (tables 2 and 3).

**Table 1** Demographic and computer use characteristics of the study population

Variables	n	%/median
Age (median)	1156	16.0
Gender		
Male	609	52.7
Female	547	47.3
School type		
Anatolian high school	356	30.8
Regular high school	332	28.7
Private high school	48	4.2
Vocational school	420	36.3
Grade level		
9	389	33.7
10	371	32.0
11	396	34.3
Frequency of book reading		
Once a week	259	23.2
Once a month	425	38.0
Less frequent	308	27.6
Not reading	125	11.2
Meeting with friends		
Each day	192	17.2
3–4 days a week	221	19.8
1–2 days a week	391	35.1
Less frequent	311	27.9
Hobby <sup>a</sup>		
Sports (football, basketball, tennis, etc.)	603	52.2
Art (music, painting, theatre, etc.)	512	44.3
Literature (book reading, poetry, essays, etc.)	352	30.4
Computer (games, Internet, communication, etc.)	198	17.1
Walking for pleasure	179	15.5
TV (documentary, series, news, etc.)	51	4.4
No hobby	109	9.4
Median monthly allowance (Turkish Lira)	1096	25.0
Median monthly family income (Turkish Lira)	951	1500.0
Computer at home		
No computer	243	21.0
One shared computer	469	40.6
Own computer	444	38.4
Computer type		
No computer	243	21.0
At least one desktop computer	654	56.6
Other computer	259	22.4
Internet at home		
No	416	36.0
Yes	740	64.0
Internet with quota	206	17.8
Internet without quota	534	46.2
Computer/Internet use outside the home		
Yes	762	65.9
No	394	34.1
Having an e-mail account		
No	132	11.4
Yes	1024	88.6
Having a social network account		
No	110	9.5
Yes	1046	90.5
Aim of Internet use <sup>a</sup>		
Education, homework, research	918	81.5
Communication, social networking	761	67.6
Entertainment, music, movies	458	40.7
Gaming, gambling	388	34.5

<sup>a</sup>The participants provided more than one answer.

The variables showing a statistically significant correlation with Internet addiction were evaluated by the binary logistic regression analysis. The final results revealed that Internet addiction was 2.0-fold more common in male than in female individuals; 2.7- and 2.3-fold more common in 9th and 10th graders than 11th graders, respectively; 1.2-fold more common in students with increased daily duration of computer use; 2.1- and 3.3-fold more common in students reading less than one book each month and reading no book at all in a week, respectively and 2.9- and 2.3-fold more common in students interested in computers as a hobby and in students with no hobby at all, respectively. Furthermore, a BSI

**Table 2** Internet addiction relative to demographic characteristics

Variables	Internet addiction				P
	Yes		No		
	n	%/median	n	%/median	
School type					
Anatolian high school	47	13.2	309	86.8	>0.05
Regular high school	46	13.9	286	86.1	
Private high school	6	12.5	42	87.5	
Vocational high school	76	18.1	344	81.9	
Gender					
Male	124	20.4	485	79.6	<0.001
Female	51	9.3	496	90.7	
Grade level					
9	70	18.0	319	82.0	<0.01 <sup>a</sup>
10	64	17.3	307	82.7	
11	41	10.4	355	89.6	
Frequency of book reading					
Once a week	27	10.4	232	89.6	<0.001 <sup>a</sup>
Once a month	50	11.8	375	88.2	
Less frequent	52	16.9	256	83.1	
Not reading	41	32.8	84	67.2	
Meeting with friends					
Everyday	41	21.4	151	78.6	<0.01
Less frequent	127	13.8	796	86.2	
Having at least one hobby					
Yes	154	14.7	893	85.3	>0.05
No	21	19.3	88	80.7	
Hobby <sup>b</sup>					
Computer (gaming, Internet, etc.)	67	33.8	131	66.2	<0.001
Other hobbies	87	10.2	762	89.8	
Art (music, painting, theatre, etc.)	56	10.9	456	89.1	<0.01
Other hobbies	98	18.3	437	81.7	
Literature (book reading, poetry, etc.)	35	9.9	317	90.1	<0.01
Other hobbies	119	17.1	576	90.1	
Median monthly allowance	225	25	926	25	0.05 <sup>c</sup>
Median monthly family income	152	1500	799	1500	0.05 <sup>c</sup>
History of at least one cigarette smoking	53	23.7	171	76.3	<0.001
No history of cigarette smoking	122	13.1	810	86.9	
Parent					
Both alive and together	154	15.4	849	84.6	0.05
Other	21	13.7	132	86.3	
Father's education background					
Primary school or less	63	14.9	360	85.1	>0.05
Junior high school	29	15.2	162	84.8	
High school	53	17.8	244	82.2	
University	29	13.2	191	86.8	
Mother's education background					
Primary school or less	85	14.2	515	85.8	<0.05
Junior high school	26	16.0	136	84.0	
High school	49	19.5	202	80.5	
University	12	9.0	121	91.0	

<sup>a</sup>Linear-by-linear association.

<sup>b</sup>The participants mentioned a variety of hobbies. The students categorized in our major hobby groups were separately compared with the ones having other hobbies.

<sup>c</sup>Mann–Whitney U test.

showed that depression and negative self-perception raised Internet addiction 1.03- and 1.05-fold, respectively (table 4).

## Discussion

In this study, we determined a high prevalence (15.1%) of Internet addiction among adolescents. Furthermore, Internet addiction was found to be independently related to gender, grade level, duration of computer use, book reading, having a hobby, depression and negative self-perception. Although rates of computer and Internet use have been increasing both in our country and worldwide at all ages, they show a particular increase among adolescents. As adolescents undergo serious developmental changes while growing up, it is easier for them to be carried away by the rich and captivating

**Table 3** Relationship of Internet addiction with computer/Internet use and Brief Symptom Inventory in students

Variables	Internet addiction				P
	Yes		No		
	n	%/median	n	%/median	
Computer at home					
No computer	24	9.9	219	90.1	<0.01
One shared computer	64	13.6	405	86.4	
Own computer	87	19.6	357	80.4	
Computer type					
No computer	24	9.9	219	90.1	<0.01
At least one desktop computer	122	18.7	532	81.3	
Other computer	29	11.2	230	88.8	
Internet at home					
No	41	9.9	375	90.1	<0.001
Yes	134	18.1	606	81.9	
Internet with quota	32	15.5	174	84.5	>0.05
Internet without quota	102	19.1	432	80.9	
Computer/Internet use outside the home					
Yes	133	17.5	629	82.5	<0.01
No	42	10.7	352	89.3	
Internet access through cell phone					
Have no cell phone	19	11.3	149	88.7	=0.05
Not connecting through cell phone	38	12.5	265	87.5	
Connecting through cell phone	118	17.2	567	82.8	
Having an e-mail account					
No	9	6.8	123	93.2	<0.01
Yes	166	16.2	858	83.8	
Having a social network account					
No	5	4.5	105	95.5	<0.01
Yes	170	16.3	876	83.7	
Aim of computer use					
Education, homework, research	125	13.6	793	86.4	<0.01
Other	48	23.1	160	76.9	
Communication, social networking	132	17.3	629	82.7	<0.01
Other	41	11.2	324	88.8	
Gaming, gambling	90	23.2	298	76.8	<0.01
Other	83	11.2	655	88.8	
Median duration of computer use (h/day)	166	3.0	864	1.5	<0.001 <sup>a</sup>
Median duration of staying connected (h/day)	155	2.5	756	1.0	<0.001 <sup>a</sup>
Median duration of staying connected to Internet through cell phone (h/day)	118	3.0	567	1.0	<0.001 <sup>a</sup>
Median number of e-mail accounts	175	2.0	981	1.0	<0.001 <sup>a</sup>
Median number of social network sites	175	2.0	981	1.0	<0.001 <sup>a</sup>
Median anxiety score	175	19.0	981	9.0	<0.001 <sup>a</sup>
Median depression score	175	20.0	981	11.0	<0.001 <sup>a</sup>
Median negative self-perception score	175	17.0	981	8.0	<0.001 <sup>a</sup>
Median somatization score	175	9.0	981	5.0	<0.001 <sup>a</sup>
Median hostility score	175	13.0	981	8.0	<0.001 <sup>a</sup>

<sup>a</sup>Mann–Whitney *U* test.**Table 4** Risk factors of Internet addiction

Variables	Exp(B)	95% CI	P
Gender			
Male	2.00	1.23–3.24	<0.01
Female	1.00		
Grade level			
9	2.72	1.60–4.63	<0.001
10	2.37	1.40–4.02	<0.01
11	1.00		
Hobby			
Other hobby	1.00		
Computer-related hobby	2.99	1.88–4.75	<0.001
No hobby	2.31	1.19–4.49	<0.05
Frequency of book reading			
Once a week	1.00	0.80–2.66	>0.05
Once a month	1.46	1.15–3.92	<0.05
Less frequent	2.12	1.67–6.82	<0.01
Not reading	3.38		
Depression	1.03	1.01–1.05	<0.01
Duration of computer use (h/day)	1.26	1.16–1.37	<0.001
Negative self-perception	1.05	1.02–1.07	<0.001
Constant: –5.56			

environment of the Internet and begin to experience social, mental and physical problems as a result. Therefore, the adolescents can be regarded as the most vulnerable age group for Internet addiction.

Studies note that the prevalence of Internet addiction varies between 2.4 and 18.8%.<sup>4,6–8,10,12–16</sup> This rate is reported to vary between 0 and 26.3% in the USA<sup>19</sup> and 4.4 and 13.5% in the European Union.<sup>20</sup> According to the literature data, the prevalence of Internet addiction appears to vary within a wide range. In our study, the prevalence of Internet addiction among adolescents was observed to be close to the upper limit. Such a high rate may be associated with poor reading habit and inadequate involvement in cultural, artistic and sportive activities.

In the present study, there was a negative correlation between the frequency of book reading and the development of Internet addiction. Thus, reading no books at all and reading less than one book per month were shown to be independent risk factors of Internet addiction. To our knowledge, there are no literature data about this. This result is an original finding of our study. It is recommended that book reading should be considered in the struggle against Internet addiction, and students should be oriented toward book reading.

In the literature, Internet addiction and 'problematic' Internet use are reported to be more common in men.<sup>1-4,6,8,10,12,13,15,16,19-22</sup> Unlike other studies, a study in Korea reported no statistically significant correlation between gender and Internet addiction or 'possible' Internet addiction.<sup>23</sup> In our study, the prevalence of Internet addiction was higher in male individuals of all grade levels, and being a male was found to present a 2-fold increased risk of Internet addiction. Our study result supports the results of other studies, with the exception of the study in Korea. This result can be explained in two ways. First, male and female individuals have different aims with regard to computer and Internet use. Studies show that men use the Internet longer than women, and they are also known to use it more for gaming, sex, entertainment and social networking, but less for academic works.<sup>1,12,20,24</sup> Second, men are known to use other addictive substances more commonly as well.<sup>25</sup> A meta-analysis on Internet addiction<sup>3</sup> notes that people with a history of addiction are at a higher risk for development of Internet addiction. These factors may explain the elevated rate of Internet addiction among men. Therefore, it is recommended to choose male individuals as the target group in studies focusing on curbing Internet addiction at schools.

Ko *et al.*<sup>4</sup> conducted a study on adolescents and reported a direct correlation between age and Internet addiction. Yang and Tung<sup>6</sup> studied high school students and noted that although the prevalence of Internet addiction drops with grade, this was not statistically significant. Johansson and Gotestam<sup>12</sup> studied Norwegian high school students and found no relationship between age and Internet addiction. In our study, we did not find a significant correlation between age and Internet addiction either. However, the prevalence of Internet addiction was higher in 9th and 10th graders than in 11th graders. This result may be associated with the education and examination systems of our country, as there is a difficult examination between primary school and high school. When students enrol in a high school (as a 9th grader) according to the results of this examination, they tend to relax and exhibit a declining interest in lessons, while spending more time in leisure activities such as those involving computers and the Internet. However, there is a Higher Education Examination, also called the university examination, awaiting them in the 12th grade. Therefore, students generally perceive the seriousness of the situation in the final high school years and start to devote most of their time to preparations for the university examination. Thus, the education and examination system of our country may be the underlying cause of high Internet addiction rates during the first years of high school, which then show a decline toward final years.

Computer and Internet are used in every aspect of life, from entertainment to shopping and banking procedures. The dazzling speed of new technologies widens the use of computer and Internet in daily life. Recently, particularly among adolescents, the duration of computer and Internet use has been further increased as a result of the availability of cell phones with Internet access. Published data demonstrate that Internet addicts exhibit a longer duration of Internet use, and the risk of Internet addiction increases with raised durations of Internet use.<sup>1,3</sup> Internet addiction is not only related to the duration of computer and Internet use, it is associated with the 'purpose' of computer and Internet use as well. The literature data show that using computer and Internet for non-educational purposes (download programs, music or movies; enter pornographic sites; play online games or chat) contributes to Internet addiction.<sup>6,8</sup> Similarly, in our study, having a hobby related to computers and increased duration of Internet use were found to be independent risk factors for Internet addiction. Adolescents tend to use Internet for easier and entertaining activities such as playing games, chatting and watching movies rather than for educational purposes. Adolescents who fail to socialize in real life feel more comfortable on the Internet and

therefore gradually increase their duration of Internet use to boost their feeling of joy. This process of self-satisfaction increases the risk of developing Internet addiction. Therefore, hobbies and activities (sports, art, science, travel and cultural activities) associated with real life should be highlighted, and children should be encouraged to use Internet and computers for these activities.

Research on adolescents indicates a significant relationship of Internet addiction with psychological and psychiatric problems. Based on these studies, Internet addiction has been reported to have a relationship with depression, anxiety, attention deficit and hyperactivity disorder, social phobia, solitude, hostility, aggressive behaviours, suicide, psychological dysfunction and emotional and behaviour problems.<sup>4,5,7,9,15,16,18,20,23,26,27</sup> Similarly, in our study, depression and negative self-perception were shown to be independent risk factors for Internet addiction. The association between Internet addiction and psychological problems is noted to be a two-way relationship, that is, psychological problems may lead to Internet addiction and Internet addiction may cause psychological problems as well. Furthermore, negative factors such as depressive thoughts, low self-confidence and poor self-perception may also contribute to the development of Internet addiction. On the other hand, Internet may help people to forget their insurmountable problems. Such mental satisfactions may explain the urge felt by people to start using Internet again. Some emotions such as euphoria, excitement and happiness may be supportive of Internet use. When an Internet addict does not use the Internet, he/she experiences negative emotions and feels unhappy, lonely and anxious; however, all those negative emotions are instantly replaced by joy, euphoria and excitement on gaining Internet access. In this process, psychological problems contribute to the Internet addiction, whereas Internet addiction may increase the psychological problems as well.<sup>3,28,29</sup> Therefore, students with a psychological problem constitute a risky group for Internet addiction. To curb Internet addiction, it is recommended that these students are given psychological and medical support.

In conclusion, the prevalence of Internet addiction among adolescents was found to be as high as 15.1%. The independent risk factors of Internet addiction were determined to be the male gender, being a 9th or 10th grader, increased duration of Internet use, having a hobby related to computers or having no hobby at all, reading less than one book per month or reading no book at all, depression and negative self-perception.

## Study Limitations

Because we performed our study close to the date of higher education examination, 12th graders could not be reached at schools and therefore were excluded from the study. The participation rate will be higher in future studies if such periods of absence are considered beforehand.

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## Key points

- 15.1% of the students were classified as Internet addicts.
- Internet addiction was 2.0-fold more common in male than in female individuals.
- Internet addiction is more common in 9th and 10th graders as well as in those who use Internet longer and have a hobby related to computers.
- Internet addiction was 2.1- and 3.3-fold more common in students reading less than one book each month and reading no book at all than once a week, respectively.
- Depression and negative self-perception raised Internet addiction 1.03- and 1.05-fold, respectively.

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