

Rapid Communication

Factors Influencing Internet Addiction in a Sample of Freshmen University Students in China

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Abstract

The prevalence of Internet addiction and influential factors associated with Internet addiction among freshmen college students were investigated in this study. A total of 3557 first-year university students from a university in northwest China were surveyed with Young's 20-item Internet Addiction Test (IAT) questionnaire, a Self-Rating Depression scale (SDS), a Self-Rating Anxiety scale (SAS), and a basic information questionnaire. A rate of 6.44% of the participants surveyed showed Internet addiction. The students with Internet addiction had higher scores of SDS and SAS compared with those without Internet addiction ($p < 0.01$). There were significant positive correlations between SDS and SAS scores and Internet addiction ($p < 0.001$). Multiple logistic regression analyses showed that a single-parent family, the age of first exposure to Internet use, the age of the student, city residence, and homesickness were significantly associated with Internet addiction ($p < 0.01$). Special and closer attention should be paid to these factors, and a risk-focus approach should be implemented in university freshmen with depression, anxiety, and other influential factors associated with Internet addiction at the beginning of their university life to guarantee the fulfillment of their academic study and graduation.

Introduction

THERE HAS BEEN a significant increase in the use of the Internet worldwide. According to a survey conducted by the China Internet Network Information Center (CNNIC) in January 2008, 210 million people had access to the Internet in China, of which 31.8% were youth between 18 and 24 years old.¹ College students are one of the major Internet users, and they are particularly vulnerable to Internet addiction because of easy access to the Internet and flexible schedules.² The Internet provides tremendous educational benefits, including access to information across a wide variety of topics, establishment of educational links, and enhancement of communication between teachers and students. However, excessive use of Internet and Internet addiction can lead to negative outcomes such as poor performance at school, social isolation, and impediment of the adolescent's psychosocial development.^{3,4}

With the growing popularity of the Internet, the problem of Internet addiction has gained attention from psychiatrists, educators, and the general public. Internet addiction is also becoming a serious mental health problem among Chinese

college students.^{5,6} Thus, to provide preventive and interventional strategy for Internet addiction at the beginning of their university life, we designed this study to investigate the prevalence of Internet addiction and identify the psychiatric symptoms and other associated factors influencing Internet addiction among a sample of freshmen university students in China.

Participants and Methods

Participants

This study recruited 3865 first-year undergraduate students from a general university (Xi'an Jiaotong University) in Xi'an, Shaanxi, China. All the participants were freshmen students majoring in different specialties. The investigation was performed after the students had finished their registration procedures and were completely settled.

The participants completed the questionnaires after the researchers had explained the purpose of the study and the procedures and requirements of the survey. All students

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were assured that they were free to refuse if they did not agree with the objective of the study. The respondents' confidentiality was also assured. All the questionnaires were presented in Chinese. The response rate was 92.03%. A rate of 7.97% of the questionnaires was not included in the analysis because of incomplete answers to the questions. Questionnaires from a total of 3557 students were included in the analysis of the study. Among the 3557 students, 2425 (68.18%) were male and 1132 (31.82%) were female. The age ranged from 17 to 24 years, with a mean of 18.77 years ($SD = 1.145$ years). The majors of the students were 2369 students (66.60%) in technical sciences, 789 (22.18%) in social sciences, and 399 (11.22%) in medical sciences. The research project was approved by the Ethics Committee of the Xi'an Jiaotong University and is in accordance with the principles of the School of Humanities and Social Sciences.

Measurement

Basic information. The basic information questionnaire was used to collect demographic information such as gender, age, residence before university registration (province, city or county), major of study, age at first exposure to the use of the Internet (experience), amount of hours spent "surfing" (using) the Internet per day, and family condition (including single-parent family and single-child family).

Young's Internet Addiction Test (IAT). Internet addiction was measured using the 20-item IAT.⁷ The participants were asked to respond to each item of the 20-item questionnaire using a 5-point scale ranging from 1, *never*, to 5, *always* (a total score ranging from 20 to 100). We defined the subjects with scores over 50 as the Internet addiction group.

Self-Rating Depression scale (SDS). The SDS is a 20-item, self-reported index of the frequency of depressive symptoms.⁸ A score below 50 was defined as normal, 50 to 59 as mild depression, 60 to 69 as moderate depression, and over 69 as severe depression.

Self-Rating Anxiety scale (SAS). The SAS, designed by Zung,⁹ was used to quantify the level of anxiety. The self-administered test has 20 questions. Each question is scored on a scale of 1 to 4 (1, *none or a little of the time*, 2, *some of the time*, 3, *a good part of the time*, 4, *most or all of the time*). Fifteen questions assessed the increasing level of anxiety, and five questions assessed the decreasing level of anxiety. The scores range from 20 to 80 (20–44, normal; 45–59, mild to moderate anxiety; 60–74, severe anxiety; 75–80, extreme anxiety).

Data analysis

Descriptive statistics were used to summarize the data. Between-groups comparisons were performed using the Student's *t* test or analysis of variance (ANOVA) for continuous variables and the chi-square test of independence for dichotomous variables. The tests were two-tailed. *P* values of less than 0.05 were considered statistically significant. Univariate correlates were assessed using the Pearson correlation coefficient adjusted for multiple correlations with a Bonferroni correction. The association between factors and Internet addiction was further examined using multiple logistic regression analysis.

Results

Prevalence of Internet addiction

Of the 3557 participants who fully completed the survey, 229 (6.44%) met the criteria for Internet addiction with an IAS score greater than 50. The percentages of Internet addiction among male and female freshmen were 6.6% (160 students) and 6.1% (69 students) respectively. No significant difference existed between male and female (Table 1). There were significant differences in the prevalence of Internet addiction among the different age groups ($p < 0.01$) with the highest prevalence in the age group of >21 years (Table 1). The technical science group and medical science group had higher prevalence of Internet addiction than the social science group ($p < 0.01$; Table 1).

SDS, SAS, and the association with Internet addiction

The Internet addiction group had significantly higher scores on the SDS and SAS than the non-Internet addiction group (SDS: 41.11 ± 7.59 vs. 33.24 ± 6.81 , $p < 0.001$; SAS: 38.31 ± 8.84 vs. 31.11 ± 5.47 , $p < 0.001$). There was a significant positive correlation between SAS scores and the level of Internet addiction ($r = 0.338$, $p < 0.001$) and between SDS scores and the level of Internet addiction ($r = 0.355$, $p < 0.001$).

Multiple logistic regression of Internet addiction associated factors

The age, gender, surfing hours per day, age of first exposure to the Internet, major, and some family and residential factors before university registration were included in analysis. The results indicated that students who came from a single-parent family, who were nonresidents of the local city where the university is located, who came from cities, or who surfed the Internet more than 4 hours a day had a higher probability of Internet addiction (Table 2).

Discussion

Much attention has been paid to the excessive use of the Internet and Internet addiction among college students, and useful information for resolving these problems has been

TABLE 1. DIFFERENCES OF INTERNET ADDICTION ACCORDING TO GENDER, AGE AND MAJOR OF STUDY IN THE FRESHMEN STUDENTS

	Number of investigated	Number of Internet addiction (%)	χ^2	<i>p</i>
Gender				
Male	2425	160 (6.60)	0.324	>0.05
Female	1132	69 (6.10)		
Age (years)				
17~	1475	71 (4.81)	29.574	<0.01
19~	1948	136 (6.98)		
21~	134	22 (16.41)		
Major				
Technical sciences	2369	198 (8.36)	51.820	<0.01
Medical sciences	399	22 (5.51)		
Social sciences	789	9 (1.14)		
Total	3557	229 (6.44)		

TABLE 2. LOGISTIC REGRESSION ANALYSIS OF FACTORS ASSOCIATED WITH INTERNET ADDICTION

	<i>B</i>	<i>Beta</i>	<i>t</i>	<i>P</i>
Gender	0.67	0.026	0.71	>0.05
Age of first exposure to Internet (8–12 years)	−0.038	−0.049	−2.559	<0.05
Surf >4 hours/day	0.651	0.655	62.290	<0.001
Single-parent family	0.024	0.022	2.123	<0.01
Single-child family	0.025	−0.001	−0.017	>0.05
Nonlocal resident	−0.017	−0.032	−2.629	<0.01
Resident of cities	0.016	0.030	1.992	<0.05

suggested in many studies.^{5,10–15} Internet addiction intervention among university students should be taken as early as possible. Therefore, investigation of Internet addiction and associated influential factors in freshmen students should be more helpful for the implementation of corresponding measures at the beginning of their university life.

Our survey showed that 6.44% of the freshmen university students met the criteria for Internet addiction, which is lower than that shown among students from all university grades in China (Internet addiction, 10.51%) investigated with IAT,⁵ those surveyed in the United Kingdom (pathological Internet use, 18.3%) using the Pathological Internet Use (PIU) scale,¹⁰ and those in the United States (Internet dependence, 26.3%) using the Internet Usage Questionnaire,¹¹ indicating the possibility of incidence increase with the prolongation of university life and the importance of taking preventive measures against Internet addiction among freshmen.

Our study showed that freshmen college students with Internet addiction had more significant, severe psychiatric symptoms than those who were not addicted to the Internet. Correlation of Internet addiction with depression has been extensively investigated and confirmed in college students.^{11,14,15} These findings support the suggestion that campus prevention programs should focus on alleviating depressive mood and conduct early screening for high-risk groups with depressive symptoms.¹⁵ Social anxiety is another important factor associated with Internet addiction in college students.^{13,16} Our results are in accordance with these findings and also support the idea that intervention against social anxiety is critical for the prevention and treatment of Internet addiction in students.¹⁷ Comorbidity of psychiatric symptoms such as depression, anxiety, and adult attention deficit hyperactivity disorder (ADHD) with Internet addiction has been demonstrated among adolescents and college students.^{18,19} Therefore, effective evaluation of and treatment for psychiatric symptoms such as adult ADHD and depressive and anxiety disorders is required for college students with Internet addiction.¹⁸

Although the relationship between loneliness and preference for online social interaction is spurious,¹³ most studies confirm the positive association of loneliness with Internet addiction.^{12,20} Our finding that freshmen college students coming from areas other than where the university is located are at high risk for Internet addiction may partly be explained by loneliness because of homesickness and unfamiliarity with the new environment. Our study suggests that the earlier the students were exposed to the Internet, the more likely they were to have Internet addiction. Older students (>21 years)

are also more likely to be Internet addicted. This may reflect the obsessive-like characteristics related to Internet use.²¹ Family factors may influence the use of the Internet.²² Parents play a crucial role: if they do not allow their child enough independence at home, the student will have problems and may turn to addictive behaviors as a coping mechanism.² We found that students coming from a single-parent family were more likely to be Internet addicts. From this result, it can be inferred that a high dependency on excessive Internet use was associated with a lack of interpersonal skill. Internet addicts tend to isolate themselves and engage in Internet use as an alternative to a real-life relationship.²³

Beginning college life is challenging for students, for freshmen in particular. Many factors can cause psychological symptoms such as depression or anxiety if the student is finding it difficult to adapt.² Excessive Internet use may contribute to the reclusive behavior of the students. In addition, college students lack the skill of self-control. All these factors may lead them to excessive Internet use. Another interesting finding from this study is that significant differences between the specialty (major) groups were observed. The subjects studied by the students may have something to do with their Internet use.^{17,24} Individuals with a major in technical science had a greater possibility of being an Internet addict in our study. This may reflect the personality and/or other factors associated with the students themselves other than the specialty (major) itself because this study was performed at the beginning of their college life and the possible effect of their major had not been exerted on them. Further research is needed to conclusively determine whether the specialty itself is a significant risk factor for the development of Internet addiction.

In conclusion, although our study is very preliminary and there may be many relevant factors that were overlooked in its design, it shows that 6.44% of the freshmen university students surveyed exhibited Internet addiction. In addition to the psychological symptoms, other influential factors are associated with Internet addiction among freshmen university students. Special attention should be paid to students with these factors at the very beginning of their university life to insure the fulfillment of their academic study. Further confirmation and identification of these and other risk factors that contribute to Internet addiction among freshmen students will lead to effective prevention and earlier treatment strategies.

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Disclosure Statement

No competing financial interests exist.

References

- China Internet Network Information Center (CNNIC). (2008) Statistical report of Internet development of China.

- www.cnnic.cn/uploadfiles/pdf/2008/1/17/104156.pdf (accessed Jan. 17, 2008).
2. Kandell JJ. Internet addiction on campus: the vulnerability of college students. *CyberPsychology & Behavior* 1998; 1: 11-7.
 3. Clark DJ, Frith KH, Demi AS. The physical, behavioral, and psychosocial consequences of Internet use in college students. *Computers, Informatics, Nursing* 2004; 22:153-61.
 4. Ozcan NK, Buzlu S. Internet use and its relation with the psychosocial situation for a sample of university students. *CyberPsychology & Behavior* 2007; 10:767-72.
 5. Wu HR, Zhu KJ. Path analysis on related factors causing Internet addiction disorder in college students. *Chinese Journal of Public Health* 2004; 20:1363-4.
 6. Cao F, Su L. Internet addiction among Chinese adolescents: prevalence and psychological features. *Child: care, health and development* 2007; 33:275-81.
 7. Young KS. Internet addiction: the emergence of a new clinical disorder. *CyberPsychology & Behavior* 1998; 1:237-44.
 8. Zung WW. A self-rating depression scale. *Archives of General Psychiatry* 1965; 12:63-70.
 9. Zung WW. A rating instrument for anxiety disorders. *Psychosomatics*. 1971; 12:371-9.
 10. Niemz K, Griffiths M, Banyard P. Prevalence of pathological Internet use among university students and correlations with self-esteem, the General Health Questionnaire (GHQ), and disinhibition. *CyberPsychology & Behavior* 2005; 8:562-70.
 11. Fortson BL, Scotti JR, Chen YC, et al. Internet use, abuse, and dependence among students at a southeastern regional university. *Journal of American College Health* 2007; 56:137-44.
 12. Ozcan NK, Buzlu S. Internet use and its relation with the psychosocial situation for a sample of university students. *CyberPsychology & Behavior* 2007; 10:767-72.
 13. Caplan SE. Relations among loneliness, social anxiety, and problematic Internet use. *CyberPsychology & Behavior* 2007; 10:234-42.
 14. Ko CH, Yen JY, Chen CS, et al. Psychiatric comorbidity of Internet addiction in college students: an interview study. *CNS Spectrums* 2008; 13:147-53.
 15. Yeh YC, Ko HC, Wu JY, et al. Gender differences in relationships of actual and virtual social support to Internet addiction mediated through depressive symptoms among college students in Taiwan. *CyberPsychology & Behavior* 2008; 11:485-7.
 16. Lo SK, Wang CC, Fang W. Physical interpersonal relationships and social anxiety among online game players. *CyberPsychology & Behavior* 2005; 8:15-20.
 17. Ko CH, Yen JY, Yen CF, et al. Factors predictive for incidence and remission of Internet addiction in young adolescents: a prospective study. *CyberPsychology & Behavior* 2007; 10:545-51.
 18. Ha JH, Yoo HJ, Cho IH, et al. Psychiatric comorbidity assessed in Korean children and adolescents who screen positive for Internet addiction. *Journal of Clinical Psychiatry* 2006; 67:821-6.
 19. Ko CH, Yen JY, Chen CS, et al. Psychiatric comorbidity of Internet addiction in college students: an interview study. *CNS Spectrums* 2008; 13:147-53.
 20. Engelberg E, Sjöberg L. Internet use, social skills, and adjustment. *CyberPsychology & Behavior* 2004; 7:41-7.
 21. Pratarelli ME, Browne BL, Johnson K. The bits and bytes of computer/Internet addiction: a factor analytic approach. *Behavior Research Methods, Instruments, & Computers* 1999; 31:305-14.
 22. Nichols LA, Nicki R. Development of a psychometrically sound Internet addiction scale: a preliminary step. *Psychology of Addictive Behaviors* 2004; 18:381-4.
 23. Whang LS, Chang G. Lifestyles of virtual world residents: living in the on-line game "Lineage." *CyberPsychology & Behavior* 2004; 7:592-600.
 24. Anderson KJ. Internet use among college students: an exploratory study. *Journal of American College Health* 2001; 50:21-6.

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