

The Social Risk Factors for Internet Addiction in College Undergraduate Students

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Abstract

Objective: The current study aims to explore precipitating and risk factors for internet addiction (IA) in university undergraduate students, and to provide evidence for interventions and the early prevention of IA in this population.

Method: Four thousand eight hundred and fifty-eight college sophomores completed an online survey on their internet use-related behaviours and social risk factors.

Result: Compared to female students (5.4%), more male students (8.3%) were in the moderate and severe IA groups. Male and female students tend to engage in different types of online entertainment. There are some shared and some different precipitating factors for internet use and risk factors for IA between the different gender groups.

Conclusion: By understanding the differences and similarities in risk factors for IA in both gender groups of the university undergraduate students, interventions can be more precisely designed to target specific behaviours in this populations.

1. Background

The internet use has grown exponentially during the past two decades. The development of the internet has brought convenience but also problems such as internet addiction (IA). Young (1998) defined IA as losing control over the time spent on the internet [1]. IA could potentially impair academic and occupational function as well as family life (Gao et al., 2010; Young, 1999). Although there have been few worldwide studies on the prevalence rate of IA, studies conducted in different geographic regions suggest that it is a severe problem shared by many countries (the China Youth Internet Association, 2005; Goel et al, 2013; Greenfield, 1999). Furthermore, IA is associated with an increased rate of mental health problems. People with heavy IA, such as pathological heavy online game consumers, are likely to develop psychiatric disorders such as depression, social anxiety, and somatic symptoms (Wei et al., 2012).

The use of internet-based entertainment differs by gender and geographic region. In the United States, male internet users spend more time on pornography, and females usually spend time on online shopping (Young, 2013). In Europe, male internet users usually play single-player online games, while females spend most of their time on social media (Durkee et al., 2012). In Korea, 56.3% of males play online multiplayer games (Ha and Hwang, 2014). In Hong Kong, 30% of participants play online games (Wang et al., 2015). Similar to other addictive behaviours, people engage in online entertainment for different reasons. Shiffman and Rathbun (2011) found that people use smoking as a way to cope with negative affect [2]. IA has a clinical presentation similar to that of substance abuse and behavioural abuse, such as withdrawal symptoms, tolerance, and craving [3]. It is worth noting the difference between males and females in addictive behaviours. For example, women were more likely than men to use smoking to cope with negative affect, and a more recent study suggested that men are more likely to report somatic symptoms such as "ill, in pain, or uncomfortable" as triggers for using drugs (Kennedy et al, 2012).

Previous studies suggested that the severity of IA is positively correlated with the amount of time individuals spend on the internet (Rooij et al; Schoenmakers et al, 2010)[4]. However, currently, as technology use skyrockets, internet-based entertainment has become more accessible through smartphones, tablets, and other portable gaming devices (e.g., Nintendo Switch). Consequently, it is more difficult to assess the amount of time and the frequency of use in the traditional manner [5, 6]. In a more recent study, Li and colleagues (2015) found that sustained time spent on online entertainment tends to increase as IA severity increases [7]. The duration of sustained online entertainment for each episode of internet use might be a better indicator to measure the amount of time of internet use.

Existing studies on risk factors for IA were conducted under the biopsychosocial model. Under this model, the family environment was considered one of the most important social factors. Single-parent, frequent migration, left-behind by parents during childhood, and deceased parents were the most common risk factors (Guo et al; Chen et al, 2012). Boys who experience negative life events are more susceptible to IA [8]. In addition to the family environment, interpersonal interaction with peers has also been studied. As a platform for sharing similar activities, the internet is a place where adolescents socialize with each other. As a result, the influence of friends could exacerbate adolescents' dependence on the internet [9, 10].

Previous studies have suggested that biological factors, social environment factors (e.g. family, friends, etc.), and other psychological conditions (e.g., depression and social anxiety) together impact individuals' internet use behaviour [11]. Positive emotions such as happiness, relaxation, confidence, and the sense of achievement that people receive from online activities could serve as moderators that exacerbate IA [12]. The findings are mixed on the effect of socioeconomic status (SES) and geographic location on IA. Family SES was found to be a predictor of IA. Specifically, children from higher SES families were more vulnerable to IA [13–15]. Parents' unemployment status and low education levels were also found to be associated with a higher risk of IA (Petry et al, 2014; American Society of Addiction Medicine, 2015). However, findings are inconsistent, and other studies suggested that parents' education level and family socioeconomic status had no impact on children's IA (Ghamari et al, 2011; Tang et al, 2014).

The current study aims to explore social risk factors for IA in college undergraduate students and to provide evidence for interventions and early prevention that target this specific population.

2. Methods

2.1 Participants

The investigation was carried out at a comprehensive university in mainland China. All sophomores (9,367) were invited to complete a questionnaire online in November 2013. A total of 4,858 (51.86%) responded and completed the survey.

2.2 Measurements

2.2.1 Demographics

The demographics collected in this self-made questionnaire included gender, age of participants, and social risk factors below in this survey.

The social risk factors included number of relocations, childhood trauma experience, whether father and/or mother deceased, infatuation with the internet before college, similar online activities in roommates, a romantic relationship, and unpleasant events on campus. They were defined as follows:

Number of relocations

Refers to the number of times the family's permanent residence was relocated. For the convenience of statistical analysis, those who had no relocation experience were assigned a value of 1, 1 relocation experience was assigned a value of 2, 2 relocation experiences were assigned a value of 3, and 3 or more relocation experiences were assigned a value of 4.

Childhood trauma experience

In this study, childhood trauma experience covers neglect and physical abuse before the age of 16. The Childhood Trauma Questionnaire has been used to evaluate childhood traumatic experience and verified as having good reliability and validity [16, 17].

Father and/or mother deceased

Whether parents are deceased.

Infatuation with the internet before college

This item was self-reported; infatuation refers to an unreasonable passion for engaging in online activities.

Similar online activities in roommates

whether roommates share similar online activities

With a romantic relationship

whether the participant was experiencing a romantic relationship or other relationships.

Unpleasant events on campus

Frequency of suffering unpleasant events after entering the university.

2.2.2 Internet use behaviours

We recorded the types of online entertainment activities (playing games, browsing information, chatting/posting comments, watching movies/TV series), the duration of sustained online entertainment (sustained engagement with online entertainment in hours for each internet use) and potential triggers for online entertainment activity, including boredom (Nalwa and Anand 2003, Gur, Yurt et al. 2015), loneliness/depression/escape (Engelberg and Sjoberg 2004, Zanetta Dauriat, Zermatten et al. 2011, Yen, Chou et al. 2014).

Young's Internet Addiction Test (IAT) revised edition by Young (2011), a 20-item self-evaluation scale including 6 levels (0 = not applicable, 1 = almost never, 2 = occasionally, 3 = sometimes, 4 = often, and 5 = almost), was used in the present study. An IAT score of 50 is commonly considered the cut-off score for IA, which means that individuals who scored 50 or higher were considered to have IA, and those who scored lower than 50 were considered being without IA [18, 19]. The total IAT score can be categorized into four classes of severity (normal: 0 to 30; mild: 31–49; moderate: 50–79; severe: 80–100) [20]. Young's IAT (2011) has been translated into different languages and has been verified to have good reliability and validity [21, 22]. The Chinese version was adopted for the present study (Cronbach's alpha: 0.9085) [23].

2.3 Statistical analysis

The participants were separated into three groups (normal group: 0–30, mild IA group: 31–49, and moderate and severe IA group: 50–100) based on the scores using the latest revision of the IAT (Young, 2011). SPSS19 was used for data analysis. Two-sample t-tests, chi-squared tests and analysis of variance (ANOVA) were used for continuous variables and categorical variables as appropriate. Multiple logistic regression analysis was applied to predict the risk of mild IA and moderate and severe IA. The statistical significance level was set as $p < .05$ (two-tailed). The Bonferroni correction and the corrected p-value were used to adjust the p-value while conducting the Chi-square analysis.

3. Results

3.1 Demographics

A total of 4,858 (51.86%) sophomores participated in the cross-sectional study. Among these volunteers, 48.93% (2,377) were males and 51.07% (2,481) were females. The mean age was 19.58, $SD = 0.87$.

3.2 Prevalence of IA and IAT mean scores

The Cronbach's alpha coefficient and Guttman split-half coefficient of IAT were 0.915 and 0.845, respectively, in the present study.

The prevalence of IA in total was 6.81% (331/4858). The IA rate was 8.3% in males (197/2377) and 5.4% in females (134/2481). A higher IA rate in male participants ($\chi^2 = 23.115$, $p < 0.001$) was found in the current study among the 4,858 respondents. Furthermore, there were significant differences in the mean IAT score between the three IA severity groups ($F = 4.344$, $p < 0.001$) (Table 1).

Table 1
IA severity group's IAT mean scores and rate by gender

IA Severity	Rate				IAT scores							
	Male		Female		x ²	p-value	Male		Female		F	p-value
	n	%	n	%			M	SD	M	SD		
The normal group	1272	53.5	1461	58.9	23.115	< 0.001	23.66	4.197	24.09	4.080	4.344	< 0.001
The mild IA group	908	38.2	886	35.7			37.89	4.794	37.48	4.978		
The moderate and severe IA group	197	8.3	134	5.4			59.91	8.962	58.15	9.382		
Total	2377	100.0	2481	100.0			32.1	11.829	30.71	10.304		

*** Table 1 about here***

3.3 Online entertainment activities, triggers, and duration of sustained online entertainment

The duration of sustained online entertainment in the moderate and severe IA groups (approximately 5 hours) was significantly higher than that in the normal group (approximately 2 hours) for both males and females.

Online gaming is the main online entertainment activity among male students in the moderate and severe IA groups (55.8%), whereas only 27% of male students in the normal group play online games.

The main trigger of online entertainment was boredom (male > 60%, female > 70%); however, negative affect was the most prevalent trigger of online entertainment activities in the moderate and severe IA groups (male 18.2%, female 12.7%, $p < 0.001$).

There is no statistically significant difference between the two gender groups in the duration of sustained online entertainment (males 2.72 ± 3.234 , females 2.58 ± 2.983 ; $t = 1.527$, $p = 0.527$). Compared to the normal group, the moderate and severe groups significantly differed in online entertainment activities, triggers, and duration of sustained online entertainment ($p < 0.001$). (Table 2).

Table 2

Sustained online entertainment duration, online entertainment activities and triggers in the moderate and severe IA groups compared with the normal group

	Male		X ² /t	P-value	Female		X ² /t	P-value
	Normal group	The moderate and severe group			Normal group	The moderate and severe group		
	n = 1272	n = 197			n = 1461	n = 134		
	N(%) / M ± SD	N(%) / M ± SD			N(%) / M ± SD	N(%) / M ± SD		
The sustained online entertainment duration (hours/every time)	2.14 ± 2.174	4.94 ± 7.725	-5.043	< 0.001	2.20 ± 2.140	4.76 ± 9.434	-3.110	0.002
Online entertainment activities			78.397	< 0.001			27.115	< 0.001
Playing games	343(27.0)	110(55.8)			30(2.1)	8(6.0)		
Browsing information	223(17.5)	18(9.1)			170(11.6)	9(6.7)		
Chatting/post bar	147(11.6)	28(14.2)			213(14.6)	23(17.2)		
Watching movies/TV series	478(37.6)	31(15.7)			923(63.2)	69(51.5)		
Others	81(6.4)	10(5.1)			125(8.6)	25(18.7)		
Online entertainment activity triggers			54.600	< 0.001			48.506	< 0.001
Boring	864(67.9)	125(63.5)			1118(76.5)	98(73.1)		
Lonely/depressed/escaping	98(7.7)	46(23.4)			87(6.0)	28(20.9)		
Friends'invitation	193(15.2)	21(10.7)			76(5.2)	1(0.7)		
Others	117(9.2)	5(2.5)			180(12.3)	7(5.2)		

Note: % is the percentage in column; Alpha level was adjusted using Bonferroni correction.

*** Table 2 about here***

3.4 Social environmental risk factors for Internet addiction

The average number of relocations was 1.92 ± 1.046 . The average score on childhood trauma experiences was 1.01 ± 1.973 . A total of 7.5% of respondents (366/4800) had a father and/or mother deceased, and 12.5% of respondents (607/4857) had been infatuated with the internet prior to college. A total of 72.1% of students (3504/4858) had roommates with similar online activities; 77.6% of students (3768/4858) did not have a romantic relationship; and 9.4% (456/4858) suffered unpleasant events on campus.

Students in the moderate and severe IA groups were more likely to report childhood trauma, being infatuated with internet entertainment before college, not in a romantic relationship, and suffering unpleasant events on campus ($p < 0.05$). Males in the moderate and severe IA groups were more likely to report relocation and father and/or mother deceased.

Additionally, more than 70% of male and female students reported that their roommates engaged in similar online entertainment activities, but the difference between the moderate and severe IA group and the normal group was only marginally significant ($p = .051$) (Table 3).

Table 3

Migration in times, Childhood trauma experiences, parents, infatuating with the internet before college, roommates, with a romantic relationship, unpleasant events on campus between the moderate and severe group and normal group

	Male				Female			
Social factors	The Normal group	The moderate and severe IA group	t/x ²	p-value	The Normal group	The moderate and severe IA group	t/x ²	p-value
	n = 1272	n = 197			n = 1461	n = 134		
	N(%) / M ± SD	N(%) / M ± SD			N(%) / M ± SD	N(%) / M ± SD		
Migration in times	1.826 ± 1.151	2.26 ± 1.505	-3.864	< 0.001	1.97 ± 1.150	2.04 ± 1.300	- .681	0.496
Childhood trauma experiences	7.06 ± 2.439	7.88 ± 2.533	-4.484	< 0.001	6.64 ± 1.527	7.20 ± 1.679	-3.386	0.001
Father and/or mother deceased			13.387	< 0.001			3.783	0.052
No	1174(93.5)	166(86.0)			1357(93.8)	118(89.4)		
Yes	82(6.5)	27(14.0)			90(6.2)	14(10.6)		
Infatuating with the internet before college			152.356	< 0.001			148.884	< 0.001
no	1169(91.9)	120(60.9)			1409(96.4)	95(70.9)		
yes	103(8.1)	77(39.1)			52(3.6)	39(29.1)		
Similar online activities in roommates			3.795	0.051			0.009	0.924
no	404(31.8)	49(24.9)			420(28.7)	38(28.4)		
yes	868(68.2)	148(75.1)			1041(71.3)	96(71.6)		
with a romantic relationship			5.563	0.018			6.780	0.009
no	969(76.2)	165(83.8)			1096(75.0)	114(85.1)		
others	303(23.8)	32(16.2)			365(25.0)	20(14.9)		
Unpleasant events in campus			147.518	< 0.001			111.463	< 0.001
rarely	543(42.7)	33(16.8)			515(35.2)	14(10.4)		
occasionally	396(31.1)	31(15.7)			579(39.6)	38(28.4)		
sometimes	231(18.2)	75(38.1)			292(20.0)	49(36.6)		
plenty	102(8.0)	58(29.4)			75(5.1)	33(24.6)		

¶: ¶(%) is the column percentage; ¶The intergroup difference test of frequency was corrected by Bonferroni correction; ¶the corrected p-value of comparison between groups of the mean is: 0.05 ÷ 3(factor number) = 0.017, while p-value < 0.017 means there is a significant difference between groups.

*** Table 3 about here***

3.5 Multiple logistic regression analysis of gender interaction risk factors for IA

The above 7 influencing factors were entered as variables using stepwise analysis, and an intergroup multiple logistic regression of IA degree was conducted with gender interaction. Risk factors for mild, moderate and severe IA were analysed (the normal group was taken as the reference variable). The model has an acceptable goodness of fit ($\chi^2 = 6013.952$, $p < 0.001$).

Infatuation with the internet before college and unpleasant events on campus were common risk factors for mild and moderate IA in both gender groups (all $p < 0.001$). In particular, infatuation with the internet before college was the strongest predictor of moderate and severe IA (male: OR = 5.739, 95% CI: 3.862–8.529; female: OR = 12.239, 95% CI: 7.523–19.911).

Roommates engaging in similar online activities displayed a significant effect on male students' IA (mild IA group, $p < 0.001$, OR = 1.535, 95% CI: 1.249–1.886; moderate and severe IA group, $p = 0.002$, OR = 1.829, 95% CI: 1.240–2.698). In contrast, female students addicted to internet entertainment activities were influenced by the absence of romantic relationships (mild IA group, $p = 0.019$, OR = 0.768, 95% CI: 0.616–0.958; moderate and severe IA group, $p = 0.006$, OR = 0.479, 95% CI: 0.284–0.809) (Table 4).

Table 4
Multivariate logistic regression analysis of gender interaction risk factors of Internet addiction

Gender interaction Risk factors		The mild IA group(IAT: 31–49 points)					The moderate and severe IA group(IAT: 50–100 points)				
		B	p-value	OR	95% confidence interval		B	p-value	OR	95% confidence interval	
					low	high				low	high
	Intercept	-3.955	0.000				-8.261	0.000			
Male	Father and/or mother deceased	0.350	0.033	1.420	1.029	1.958	0.497	0.061	1.644	0.978	2.765
	Infatuating with network before college	1.159	< 0.001	3.186	2.440	4.158	1.747	0.000	5.739	3.862	8.529
	Unpleasant events on campus	0.276	< 0.001	1.318	1.187	1.463	0.547	0.000	1.728	1.432	2.087
	with a romantic relationship	-0.204	0.081	0.815	0.648	1.026	-0.417	0.071	0.659	0.419	1.036
	Similar online activities in roommates	0.428	< 0.001	1.535	1.249	1.886	0.604	0.002	1.829	1.240	2.698
	Childhood trauma experiences	-0.013	0.519	0.987	0.947	1.028	0.040	0.190	1.041	0.980	1.106
	Migration in times	0.105	0.026	1.110	1.013	1.218	0.147	0.071	1.158	0.988	1.358
Female	Father and/or mother deceased	0.076	0.665	1.079	0.766	1.520	0.667	0.033	1.948	1.056	3.592
	Infatuating with network before college	1.421	< 0.001	4.143	2.937	5.844	2.505	< 0.001	12.239	7.523	19.911
	Unpleasant events in campus	0.264	< 0.001	1.302	1.162	1.458	0.489	< 0.001	1.630	1.294	2.053
	with a romantic relationship	-0.264	0.019	0.768	0.616	0.958	-0.736	0.006	0.479	0.284	0.809
	Similar online activities in roommates	0.335	0.001	1.398	1.143	1.708	0.388	0.064	1.473	0.978	2.221
	Childhood trauma experiences	0.053	0.017	1.054	1.010	1.101	0.058	0.176	1.060	0.974	1.154
	Migration in times	0.073	0.107	1.076	0.984	1.176	-0.064	0.509	0.938	0.776	1.134

Note: P < 0.05 was considered statistically significant.

Unpleasant events in campus: 1 = Rarely, 2 = Occasionally, 3 = Sometimes, 4 = Plenty

Similar online activities in roommates: 1 = No, 2 = Yes

with a romantic relationship: 1 = No, 2 = Others

Infatuating with the internet before college: 1 = No, 2 = Yes

Father and/or mother deceased : 1 = No, 2 = Yes

Migration in times: 1 = 0, 2 = 1, 3 = 2, 4 = 3 and more

4. Discussion

In the present study, we found that more male than female students had moderate and severe IA. In the moderate and severe IA group, both male and female students tended to continuously use the internet for more than 5 hours once they started; the main online activity for the male students in the moderate and severe IA groups was online gaming, while for the female students in the moderate or severe IA groups, it was online streaming (e.g., watching movies and dramas). Boredom was the most prominent trigger for using internet-based entertainment; however, negative affect-triggered internet use was more likely to become moderate or severe IA. Infatuation with the internet before college and adjustment issues after entering college were shared risk factors for both gender groups in the mild and moderate IA groups. Roommates engaging in similar internet-based entertainment was a risk factor only for male students' IA and not being in a romantic relationship was only a risk factor for female students' IA. Relocation, the death of one or both parents, and childhood traumatic experience only affected mild IA.

Type of internet use

The main type of internet-based entertainment was different between male and female participants. Similar to previous research, our study found that online gaming is the main type of IA for male students [24]. For the female students in the moderate and severe IA group, 51.5% chose to use online streaming services as their main internet-based entertainment. This is possibly due to the relatively easy accessibility of online streaming services. It is also a risk factor for IA in female students, suggesting that research on female college students' IA should focus on this subtype. The different choice of internet-based entertainment between male and female students may be due to their unique needs and goals in using the internet.

Duration of sustained online entertainment

The duration of sustained online entertainment was used as an indicator of prolonged internet use for IA. It varied from 2 hours in the normal group to 5 hours in the moderate and severe IA groups. Previous studies usually use "how many hours per day" and "how many days per week" to assess the severity of IA [5, 6]. Wei and colleagues (2012) suggest that women tend to have shorter duration of sustained online entertainment, which is contradictory to our findings [24]. Our study found no statistically significant difference between gender groups, which suggests that it could potentially serve as a universal indicator of the severity of IA for both men and women.

Triggers of internet-based entertainment

Boredom, stress, and negative affect were common triggers of massive internet use [25, 26]. Boredom was the main trigger of mild IA. Participants in the moderate and severe IA group reported a significantly higher incidence of negative affect-triggered internet use than boredom-triggered use. This suggests that online entertainment serves as a coping mechanism for individuals with moderate to severe IA. Female students rarely report invitation from friends as a trigger for online entertainment, while it is the second most reported trigger from male students.

Risk factors for IA

History of using the internet (infatuation with the internet) is considered a predictor of IA. Most individuals with internet game addiction reported having their first contact with online games in primary school and with internet overuse in middle school [7]; the time point of first contact might influence the severity of IA [24]. Our study yields a similar finding that experience with online games during early adolescence has an important impact on internet game addiction. Additionally, infatuation with the internet before college and adjustment issues at the beginning of college are common risk factors across gender groups.

IA could be a result of genes and environmental interactions. First-degree relatives of pathological gamblers showed significantly higher incidences of addictive behaviours compared to control groups [27] [28]. A twin study discovered that IA is 20 to 48 percent influenced by genetic factors [29] [30] and over 50 percent by environmental factors [30]. The current study found that infatuation with the internet before college and early encounters with the internet at a young age are prominent risk factors for IA.

This suggests that genetic vulnerabilities combined with the influence of the family environment may play an important role in early contact with online entertainment and IA in childhood or adolescence.

Clinical implication

Since the current study found that boredom is a common trigger of internet use for the majority of college students, it is important to create interventions that target this problem. In China, high school students commonly spend an enormous amount of time preparing for college entrance exams. After the exam, students who were successfully admitted by colleges suddenly have much free time and wonder what is the source of their boredom. Facilitating and helping students engage in meaningful campus activities might help to reduce it. This further reduces the likelihood of students being addicted to the internet. Additionally, schools should pay close attention to the differences in triggering events between gender groups and design interventions accordingly.

Because online entertainment could potentially serve as a coping mechanism for negative affect, teaching students emotional regulation and stress management skills could be beneficial. Furthermore, preventions should be considered starting earlier, since early contact with the internet is associated with IA in college. Parents and teachers in elementary and middle schools should be prepared to be the first line of defence. Preventions could strive to put restrictions on the duration and type of online activities of children and internet use for adolescents.

Limitations

Since our study is conducted on college undergraduate students, the results may have the limitation of being generalizable to the broader population. Future research on this topic could include participants' genetic information and family environment (e.g., how parents use online entertainment or whether parents have any kind of addiction) on a more diverse population.

Abbreviations

ANOVA analysis of variance

IA internet addiction

IAT Internet Addiction Test

SES socioeconomic status

Declarations

Ethical approval and consent to participate The present study was approved by the Medical Ethics Committee of West China Hospital of Sichuan University. Online written informed consent was obtained from all participants.

Consent for publication Written informed consent for publication was obtained from all participants.

Availability of data and materials Not applicable

Competing Interests The authors declare that they have no conflict of interest.

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Authors' contributions

Wan-jun Guo, Ya-jing Meng MD, Hui-yao Wang, Xiao-jing Li, Wei Deng, Lian-sheng Zhao, Xiao-hong Ma, Ming-li Li, Ting Chen, Andy S.K. Cheng analyzed and interpreted the data regarding the internet addiction. Jingyan Gu performed was a major contributor in writing the manuscript. All authors read and approved the final manuscript.

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