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Online activities, prevalence of Internet addiction and risk factors related to family and school among adolescents in China

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ABSTRACT

Aims: To investigate the online activities, prevalence of Internet Addiction in relation to demographic characteristics and risk factors related to family and school among adolescents.

Methods: A total of 6468 10–18 year old adolescents recruited from local schools in Guangzhou, China were selected by adopting multi-stage stratified random sampling (female/male: 2886/3582; mean age:13.78 ± 2.43). Participants completed a structured questionnaire.

Results: The overall prevalence of Internet Addiction was 26.50%, with severe addiction being 0.96%. Internet Addiction was higher among males than females (30.6% versus 21.2%). Older grade students reported more Internet addiction rate (χ^2 = 431.25, P < 0.001). The five highest-ranked online activities were social networking (94.73%), school work (86.53%), entertainment (82.44%), Internet gaming (73.42%) and shopping online (33.67%). A negative relationship with teachers (OR: 1.35, 95% CI: 1.20–1.53), a negative relationship between two parents (OR: 1.23, 95% CI: 1.18–1.37), and poor academic performance (OR: 1.22, 95% CI: 1.17–1.35), showed the highest relative risks for Internet addiction.

Conclusions: Severe Internet Addiction is not common, but mild Internet addiction was reported by more than one fourth of all participants. The rates of Internet Addiction varied by gender, grade, the quality of family relationships and school situation, suggesting these factors should be considered when designing and implementing interventions.

1. Introduction

Internet use has grown world-wide to 3.3 billion users, which is 46.4% of the world population (Internet World Stats, 2012). In China, Internet penetration is 50.3%, representing 688 million people (Cao, Sun, Wan, Hao, & Tao, 2011). Since Young's work (Young, 1998) on Internet problems, the issue of Internet Addiction (IA) has received a great deal of research attention.

IA can be defined as an inability to control one's use of the internet despite negative consequences (Griffiths, 2000, Tang, Wei, Qin, Liu, & Zhou, 2014), and which persists over a significant period (Kardefelt-Winther et al., 2017). However, there is not a general agreement on the definition of IA. Research indicates that the actual addiction is associated with the use of specific online activities which means each addiction is characterized by specific patterns of maladaptive behaviors (Starcevic & Aboujaoude, 2015). According to this perspective, given that some common factors in the spectrum of addictions should be recognized such as impulsivity and addictive personality (Montag et al., 2014).

Epidemiological studies on IA have reported variations in prevalence world-wide. The research conducted in Europe and the United States showed a prevalence of Internet addiction (pathological internet use or problematic Internet use) from 7.9% to 25.2% among adolescents (Ko, Yen, Yen, Chen, & Chen, 2012; Phillips, Ogeil, & Blaszczynski, 2012; Bernardi & Pallanti, 2009; Durkee et al., 2012), while the Middle-East and Africa had rates from 17.3% to 23.6% (Ghassemzadeh, Shahraray, & Moradi, 2008; Adiele & Olatokun, 2014). Studies in Asia have shown a higher variation in prevalence among young people and adolescents, ranging from 8.1% to 50.9% (Kim et al., 2006; Mak et al., 2014). In China, the rates ranged from 6% to 10% (Cao et al., 2011; Lai et al., 2013; Wu et al., 2013).

However, these prevalence data were collected several years ago, The Internet offers more and more applications and options for engagement. In addition, social networking sites have gained substantial popularity and have become a dominant daily social practice, which might accelerate Internet use to a great extent (Müller et al., 2016).

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There is reason to believe that more and more people, especially adolescents, will be affected by IA. Updated data are needed to comprehend current Internet use and help develop interventions for overuse.

IA creates psychological, social, school and work problems and difficulties in a person's life (Cerniglia et al., 2016), especially for adolescents. Although the results are not always consistent, IA has been reported to be associated with alcohol abuse (Ko, Yen, Chen, Chen, & Yen, 2008), depression (İskender & Akin, 2010; Shapira, Goldsmith, Keck, Khosla, & McElroy, 2000; Yen, Ko, Yen, Wu, & Yang, 2007, Moreno, Jelenchick, & Christakis, 2013), anxiety and stress (İskender & Akin, 2010). In addition, A meta-analysis indicated that problematic Internet use is associated with lower well-being (Çikrıkci, 2016; Odacı & Çıkrıkçı, 2014), and many researchers agree that IA negatively affects the individual's positive view of life among adolescents (Valkenburg & Peter, 2007; Çikrıkci, 2016; Telef, 2016).

Regarding psychosocial risk factors of IA, male gender (Tsai et al., 2009), metropolitan living area, low parental involvement (Yen, Yen, Chen, Chen, & Ko, 2007), negative parent-child relationships (Chi, Lin, & Zhang, 2016; Samek, Hicks, Keyes, et al., 2015) and negative peer relationships (Yen et al., 2007) have been found to be related to IA (Durkee et al., 2012). Young (1998) proposed a theory that IA is a behavioral pattern that, although problematic, serves to compensate for other negative aspects of life, perhaps by reducing negative affect. Based on the theory, frustration and other difficulties encountered in real life may contribute to IA because the Internet provides an escape from negative affect (Tang et al., 2014). These failures and frustrations could come from family, school life or social relationships.

However, our understanding of the risk factors for IA is not complete. One issue that is unclear is whether these risk factors are limited to a specific culture, as most studies on risk factors have been conducted in western societies. In addition, problems in adolescent relationships at school may be important risk factors. The relationship between adolescents and their classmates or teachers could greatly influence their psychological condition, and thus possibly influence Internet use. To our knowledge, no studies to date have examined the combined effects of personal situation, parenting, family relationships, peer relationships and school conditions as contributing factors to Internet addiction in China.

For these reasons, we carried out a large-scale study of the Internet use of Chinese adolescents aged 10 to 18. The purposes of the study were to document the prevalence of adolescent IA, to collect descriptive information about the ways that adolescents use the Internet, and to identify risk factors including personal factors like gender and age, family (parenting way, the relationship between parents et al.), and social factors such as peer relationship, academic performance for adolescent IA in a Chinese sample.

2. Methods and materials

2.1. Study design and samples

The data collection was using paper and pencil. The study was conducted between March 2015 and September 2015 in Guangzhou, the largest city in southern China, with a population of 12.92 million in 2015. The sample was stratified by region(urban and rural area), school type(key school and normal school) and grade(primary, middle and high school/college) A total of 6822 students in 167 sampled classes from 10 primary schools, 9 middle schools, 10 high schools and colleges were recruited, 296 missing values were excluded, valued date rate was 95.7%, 58 participants who were under 10 years old were screened out according to the WHO's standard of adolescent, leaving 6468 (94.8%) participants' data were used for statistical analyses.

Ethics approval was obtained from the Guangzhou University Ethics Committee. Parents gave written informed consent (for students who were under 18 years old) and students gave written informed assent before completing the questionnaire. Thirty postgraduate psychology students were trained by the main investigator and administered the measures during class. Students were told their answers were anonymous. All teachers and school administrators were asked to leave while students were completing the questionnaire.

2.2. Measures

A self-designed questionnaire was used to measure the demographic data and specific student characteristics such as family type, relationships with parents, parents' monitoring of Internet use, school performance and relationship with teachers and classmates.

The Chinese version of the Internet Addiction Test (IAT) (Kuang, Cao, & Dai, 2011; Young, 1998) was adopted to measure Internet use over the past 6 months. The Cronbach's α of IAT is 0.91. The IAT consists of three subscales: withdrawal and social problems, time management and performance, and reality substitute. Altogether there are 20 items that measure mild, moderate and severe levels of Internet addiction. Each item was rated on a 5-point scale ranging from 1 = “never” to 5 = “always.” Item scores are added to create a final score, categorized as Normal Internet Use: 20–49; Mild Addictive Use: 50–79; Severe Addictive Use: scores over 80.

The Parenting Behavior Questionnaire for Chinese Parents (PBQ-CP) (Jiang, Xu, Jiang, & Zhen, 2009) was used to assess general parenting behavior. The scale consists of 30 items that measure five dimensions, including physical punishment, overprotection, emotional warmth, inconsistent upbringing and neglect. The Cronbach's α of Whole scale and each subscale have been shown in table 3. Responses were rated on a 5-point scale ranging from 1 = “never” to 5 = “always.” Participants were asked to rate their father and mother on each item separately. Higher scores on a dimension meant higher overprotection, neglect, inconsistency upbringing or emotional warmth respectively. We used both five subscale scores and one overall score in the analyses. It took around 20–25 min to finish the questionnaires for all adolescents.

2.3. Statistical analyses

Descriptive analysis was used to identify the demographic background characteristics of the sample and determine the prevalence of addictive use. A series of chi-square tests was employed to compare addictive and non-addictive Internet users in terms of demographic characteristics and parent behaviors related to Internet use. A logistic regression analysis was calculated, with Internet user group as the dependent variable and demographic, school and family factors as the explanatory variables. Statistical Package for Social Sciences software (SPSS for Windows 19.0, SPSS Inc., Chicago, IL) was used to conduct the analyses.

3. Results

3.1. Demographics and online activities

The mean age was 13.78 ± 2.43 (Min: 10 - Max: 19). There were 2589 (39.70%) participants who were the only child in the family. The general characteristics of the participants are shown in Table 1.

For 56.01% of participants, the reported length of time online per day was within 1 h, and another 8% reported using Internet > 4 h each day. Males spent significantly more time online than females ($Z = 7.57$, $P < 0.001$).

The mean age of first online activity was 8.7 ± 2.6 years. For the male participants the mean age was 8.6 ± 2.7, which was younger than for the female participants, 8.9 ± 2.5 ($t = 6.03$, $P < 0.001$). Age of first use also varied by grade level: primary students, 7.3 ± 1.90; middle school students, 9.2 ± 2.4; and high school/college students, 9.8 ± 2.8 ($F = 664.16$, $P < 0.001$). The addiction group (including to severe and mild addiction) also showed significant differences in age at first use compare to normal group.

Table 1
Demographic characteristics, online activities, risk factors of the sample and the prevalence of Addictive Internet use (N = 6468).

	Regular use N (n%)	Mild addiction N (n%)	Severe addiction N (n%)	χ^2	*P*
Gender (n, %)				73.7	0.000
Male	2486 (69.4)	1052 (29.4)	44 (1.2)		
Female	2274 (78.8)	594 (20.6)	18 (0.06)		
School year (n, %)				42.0	0.000
Primary school10–12	1890 (89.2)	228 (10.8)	2 (0.09)		
Middle school 13–15	1389 (69.6)	583 (29.2)	24 (1.2)		
High school/college 16–19	1481 (63)	835 (35.5)	36 (1.5)		
Residency (n, %)				49.4	0.000
Urban area	1879 (69.1)	806 (29.6)	34 (1.2)		
Suburb area	2881 (76.8)	840 (22.4)	28 (0.75)		
Self-report family economy (n, %)				70.1	0.000
Lower	299 (62.4)	170 (35.5)	10 (2.1)		
Middle	2842 (72.1)	1063 (27)	37 (0.94)		
Upper	1619 (79.1)	413 (20.2)	15 (0.73)		
Parents' monitoring online activities (n, %)				20.9	0.000
Never	861 (74.6)	282 (24.4)	11 (0.95)		
Occasional	2081 (71.4)	814 (27.9)	21 (0.72)		
Often	1818 (28.1)	550 (22.9)	30 (1.3)		
Social network (n, %)				23.7	0.00
Use	4530 (73)	1611 (26)	61 (0.98)		
No use	230 (86.5)	35 (13.2)	1 (0.37)		
School work (n, %)				0.8	0.66
Use	585 (73.2)	204 (25.5)	10 (1.2)		
No use	4175 (73.6)	1442 (25.4)	52 (0.92)		
Entertainment (n, %)				36. 4	0.000
Use	3911 (72.2)	1457 (26.9)	52 (83.9)		
No use	849 (81.)	189 (18)	10 (16.1)		
Online gaming (n, %)				88.9	0.000
Use	1376	283	12		
No use	3384	1363	50		
Online shopping (n, %)				99.5	0.000
Use	1485 (61.3)	726 (32.4)	33 (1.5)		
No use	3275 (77.5)	920 (21.8)	29 (0.7)		

The five most frequent online activities among participants were social networking (94.73%), school work (86.53%), entertainment (82.44%), Internet gaming (73.42%) and shopping online (33.67%). Males reported higher rates of all online activities ($P < 0.05$) except social network use ($P = 0.78$). Adolescents engaging in social networking, online gaming, online shopping and online entertainment showed higher prevalence of mild and severe addiction than those who did not engage in these activities (see Table 1).

3.2. Prevalence of Internet addiction

There were 62 (0.96%) respondents who were classified as severe Internet addicts. The prevalence rate including mild and severe IA was 26.5%, significantly higher in boys than in girls (30.59% vs. 21.20%, $\chi^2 = 73.74$, $P < 0.000$) and with significant differences among school age groups (primary school 10.84% vs middle school 30.40% vs high school 37.03%, $\chi^2 = 420.3$ $P < 0.000$). Students living in the rural area had a significantly lower relative risk of IA than those living in the urban area (23.16% vs 30.89%, $\chi^2 = 49.44$, $P < 0.000$) (see Table 1).

3.3. Socio-demographic and school contributors to IA

Because severe addiction rate is very low, we combined mild and severe addiction (IAT score ≥ 50) and calculated the contributors of IA based on two groups which are addiction and regular use group. There are significant difference of IAT score between two groups, $t = 96.06$, $P < 0.000$, Cohen's $d = 2.74$.

Gender, grade, academic performance, study and exam pressure, relationship with teacher, and having classmates who showed problematic Internet use were all correlated with IA (all *P*s < 0.05). Logistic regression showed that poor academic performance, a negative relationship between teachers and student, academic pressure and having classmates with problematic Internet use contributed to the risk of IA after controlling for demographic characteristics (see Table 2).

Table 2
The association of Internet Addiction and demographic, school and family factors (n = 6468).

Factors	Mild and severe IA		
	OR	95% CI	*P*
Gender	0.76	0.63–0.91	0.003
Age	1.22	1.16–1.29	0.000
Relationship between two parents	1.23	1.18–1.37	0.00
Mother's parental way	1.02	1.01–1.03	0.01
Mother's ignorance	1.06	1.03–1.09	0.001
Mother inconsistent upbringing	1.17	1.16–1.25	0.049
Parents' monitoring the length of online	1.16	1.09–1.23	0.000
Academic performance	1.22	1.17–1.35	0.000
Pressure from study and exam	1.18	1.08–1.29	0.000
Relationship with teachers	1.35	1.20–1.53	0.000
Addictive classmates	1.18	1.10–1.29	0.000
Father over protection	1.06	1.02–1.09	0.001
First time age online activity	0.92	0.89–0.95	0.000

3.4. Family risk factors in relation to Internet addiction

All subscales of PBQ-CP had good internal reliability with samples (see Table 3). Multivariate ANOVA showed that all five dimensions of general parenting behavior were significantly different between addicted and non-addicted Internet users (*P*s < 0.000). Each dimension was also correlated with IA (*P*s < 0.000). Logistic regression indicated that a negative relationship between two parents, mother's inconsistent parenting, mother's neglect, and a lack of parental monitoring of Internet use were associated with IA (all *P*s < 0.05) after adjusting for age and gender (Table 2).

4. Discussion

In this study, we investigated the prevalence of Internet addiction, the ways that adolescents use the Internet, and personal, family and school factors as risk factors for IA in a large sample of Chinese adolescents. The study site has been shown to be representative of metropolitan areas of China, and thus the findings can be considered generalizable to a certain extent. This study is unique in that it provides updated estimates of IA prevalence in China, and identifies patterns of Internet use and risk factors for IA in the Chinese cultural context.

4.1. The prevalence of Internet addiction

The prevalence of Internet mild addiction and severe addiction among all the participants was 25.4% and 0.96%, respectively. These results are comparable with the rates of 17% and 2% reported in Europe (Durkee et al., 2012) and the rates of 32% and 3% in Hong Kong (Mak et al., 2014). The rate of 25.4% also suggests an increase in the prevalence of mild addiction in mainland China, based on a comparison with earlier studies that used the same measure of addiction, with rates of 8% in a study of eight Chinese cities in 2008 (Cao et al., 2011), 6% in 2010 (Tang et al., 2014) and 13.5% in 2013 (Wu et al., 2013) both in Wuhan. Variations in the prevalence of IA could be due to differences

Table 3
The difference of parenting behavior between regular and addiction users (n = 6468).

	Regular use	Mild addiction	Severe addiction	*Cronbach's Alpha*	*F*	*P*
IAT total score (mean ± SD)	36.33 ± 7.9	58.19 ± 6.9	87.02 ± 7.01	0.89	6056	0.000
F inconsistent upbringing	9.79 (3.02)	11.53 (2.88)	12.97 (3.82)	0.53	19.37	0.068
M inconsistent upbringing	10.03 (3.07)	11.91 (2.85)	12.98 (3.96)	0.66	20.54	0.000
F overprotection	8.97 (3.14)	10.28 (3.09)	12.52 (3.98)	0.57	11.41	0.000
M overprotection	9.62 (3.28)	11.02 (3.19)	12.98 (3.92)	0.68	11.50	0.000
F physical punishment	9.99 (418)	12.12 (4.68)	16.13 (7.25)	0.81	16.26	0.000
M physical punishment	10.05 (4.09)	12.06 (4.53)	15.36 (6.97)	0.79	15.67	0.000
F positive parenting way & emotional warmth	12.33 (4.01)	11.59 (3.59)	11.65 (4.88)	0.81	− 6.02	0.000
M positive parenting way emotional warmth	12.98 (3.98)	12.35 (3.52)	12.76 (4.46)	0.70	− 4.96	0.000
F neglect	1076 (3.97)	13.14 (4.28)	15.17 (6.88)	0.73	18.99	0.000
M neglect	10.49 (3.79)	12.80 (4.13)	15.33 (692)	0.81	18.31	0.000

*F: father M: mother.

across investigating sites, sample size, or the time frame of the performed research (Durkee et al., 2012). However, the overall trend in China appears to be an increase in the rate of addiction, consistent with the dramatic increase in the role of the Internet in adolescents' social life in recent years.

The reported onset age of online activity decreased with the age of participants. This result is in accord with the fact that Internet use is increasingly integrated into people's lives. The finding suggests that people are starting to access the Internet earlier and earlier, highlighting the need for Internet use education in early school grades. Our results also indicated that adolescents living in urban areas had an increased risk of IA. This is also consistent with previous research and it might be because specific factors like higher Internet penetration or higher economic status in urban areas increase the risk of IA (Durkee et al., 2012).

4.2. Online activities and social network use

Social networking, school work, entertainment, gaming and shopping ranked as the top five among all the online activities. Social networking sites such as Facebook, Twitter or Instagram in western countries and Kakao Talk or We Chat in China have gained substantial popularity in recent years and have become a dominant daily social practice among adolescents (Sampasa-Kanyinga & Hamilton, 2015). Research conducted in Asia indicated that 70% participants from the Chinese mainland and 65% from Hong Kong used social networking sites (Mak et al., 2014). Among the participants in the current study, the rate is 95.9%. There are 97.9% of IA individuals (including mild and sever IA) using social networks. This result partially corroborated the finding of Sampasa-Kanyinga and Hamilton (2015) and Tsitsika et al. (2014): Adolescents using social networking sites intensely were more often classified as showing IA and displayed higher psychosocial distress. Thus, the high prevalence of IA may be partially explained by the high usage rate of social networks.

Social networking has become the main means of communication among adolescents. It has been shown that social networking has a strong association with a range of mental health problems (Sampasa-Kanyinga & Hamilton, 2015). The newest study indicated that Problematic Facebook Use has been considered a potential mental health problem (Marino, Gini, Vieno, & Spada, 2018). However it is probably different from the case of Internet gaming, as the relationship between social network use and mental health problems may not be direct (Müller et al., 2016). That is, the positive qualities of social networking may mitigate the risk of IA. To some extent, social network use can be helpful for adolescents' development by maintaining and enhancing communication with peers whom they know in everyday contexts.

As we know, the supportive function of peer relationships is particularly important for adolescence; their interpersonal interactions online could provide more chances to exchange views and support each other. As a result, social networking has become a key context wherein adolescents can accrue developmental benefits (Tzavela & Mavromati, 2013). It has also been found to confer significant benefits for adolescents suffering from social exclusion and isolation (Allen, Ryan, Gray, McInerney, & Waters, 2014). Thus, it is necessary to clarify valid and non-harmful online activities and adopt suitable methods to guide adolescents' Internet use.

4.3. Risk factors for IA

The present study showed that the prevalence of IA varies with gender. This substantiated the results of previous investigations showing that males had a higher prevalence of mild and severe Internet addiction (Ko et al., 2012; Adiele & Olatokun, 2014; Cao et al., 2011; Mak et al., 2014). Also, the results showed that gender-specific online activities were correlated with IA. Among males who showed IA, the number who used social networking and online gaming sites significantly outweighed the number who did not use these two online activities. According to Smith, Chein, and Steinberg (2013), this could be because males experience higher motivational drives than females in Internet use, rendering them more likely to learn reward values.

The most robust findings from this study concern family and school conditions as risk factors for IA. A negative relationship with teachers, a negative relationship between parents, and low academic performance were the strongest statistical predictors of IA, suggesting that they may be causal factors in the development of this problem.

It is important to note, however, that unhappy circumstances at home and at school may serve as both predictors and consequences of IA. Previous researchers have shown that adolescents' risky behaviors are correlates of problematic familial relationships, lack of school activities and social life, and lack of supervision and monitoring (Durkee et al., 2012). Adolescents in China spend most of their daytime hours in school, and academic performance is the most important consideration for them. Students often experience enormous pressure related to academics. In the process of learning, the relationship with teachers may have a great influence on students. A negative relationship with a teacher might cause extra stress, and adolescents might potentially use the Internet as a method to cope.

Having classmates who show addictive Internet use has also been found to be associated with increased likelihood of IA. Adolescents are in a sensitive period in which peer relationships could be very important, and they have strong wishes to get peers' acceptance. Some of them might imitate a peer's behavior for these reasons.

The relationship between parents, mother's inconsistent parenting and neglect, and low parental involvement in adolescents' Internet usage were found to be significant risk factors for IA in the current study. This is consistent with previous research conducted in China in 2013 (Wu et al., 2013) and Europe in 2012 (Durkee et al., 2012), suggesting that the relationship between the parent and child and the relationship between parents have a large influence on adolescents' risky behaviors. Parental involvement in their children's education has

been the subject of much research (Gonida & Cortina, 2014) indicating parental active involvement could lead adolescents to utilize the Internet in suitable and beneficial ways (Mishna, Khoury-Kassabri, Gadalla, & Daciuk, 2012). A good relationship between parents and effective parenting are important for adolescents to develop effective coping, which could offer adolescents a steady and healthy environment for growth and help prevent them from engaging in incipient risky behaviors including Internet overuse (Yen et al., 2007). This suggests that a family-based preventive approach for Internet addiction should be introduced for adolescents with family risk factors.

A major strength of this study is the large sample of adolescents recruited from randomly selected schools based on stratification by region and age, across 29 study sites. There are also several limitations in this study that need to be noted. A version of the IAT that focuses specifically on the Internet addictive behaviors of adolescents may be required for more accurate results. In future research, it might be useful to analyze the data separately for different demographic groups, such as children under 10 years old or female adolescents et al. which may reflect significant difference. Last, the data were collected from one developed city in China. Although there was diversity in terms of rural/urban area and students came from schools from all areas of the city, the findings from this study may not be generalizable to adolescents in other parts of China.

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