

The Relation of Personality Traits to Internet Addiction and Internet Social Behaviour in Chinese Secondary School Students

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ABSTRACT

The present study attempts to study the relationship between internet addiction and internet social behaviour with personality. The sample consisted of 365 Grade 10 students from two secondary schools in Mainland China. Four instruments were used: Young's Internet Addiction Test, Chen Internet Addiction Scale, Ma, Li & Pow's Adolescent Internet Use Questionnaire, and Eysenck Personality Questionnaire. Boys scored significantly higher than girls in the two Internet addiction questionnaires. Results also supported the following hypotheses: (1) Internet addiction is positively associated with psychoticism, neuroticism, and frequency of Internet use; and it is also negatively associated with social desirability and self-concept. (2) Holistic Internet social behavior is positively associated with extroversion, social desirability, self-concept, and frequency of Internet use; and it is also negatively associated with psychoticism and neuroticism. A high (low) rating of Holistic Internet Social Behavior refers to a high (low) rating of Prosocial Internet Behaviour and a low (high) rating of Antisocial Internet Behaviour.

INTRODUCTION

Characteristics and Prevalence of Internet Addiction

Various research studies in the past decade concluded internet addiction as a quickly growing and highly alarming social issue. Substantial attention had been attracted to a variety of problematic online applications which include a sexual online chat room, general online chat room, online pornography, online gambling, online gaming, online auction houses, and online shopping (e.g., Young, 2007). Thereafter, attention has also been drawn to the issue of internet movie/television streaming addiction (Allen, 2014). Even though excessive gaming, sexual preoccupations, and text-messaging have long been regarded as subtypes of internet addiction among many researchers (Block, 2008) and neurophysiological psychiatric research on people such as those with excessive and problematic viewing of online sexual images using the technology of fMRI further suggested the existence of internet porn addiction as a specific type of internet addiction (Voon et al., 2014), the American Psychiatric Association (APA) based on the empirical evidence from Asian societies which centers on male youths and adolescents, singled out internet gaming as a mental disorder in Section III of the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (i.e., DSM-V) in 2013 and named it as "Internet Gaming Disorder" (American Psychiatric Association, 2013). So far, "Internet Gaming disorder" was not yet an official psychiatric diagnosis for the reason that internet gaming addiction and the much broader concept and prevalent occurrence of internet addiction "has not been around long enough or sufficiently studied to warrant official disorder status"

(Techaddiction, 2021). The naming of this new phenomenon has long been controversial (e.g., Kuss, Griffiths, & Pontes, 2017) and has not been resolved so far. Researchers used to adopt a variety of alternative names to refer to the newly emerged mental health problem, for example, "pathological computer use", "virtual addiction", "internet addiction disorder", "excessive internet use", "compulsive internet use", "problematic internet use", and "pathological internet use". However, terms such as "pathological computer use" could be quite misleading and outdated. With the ever-evolving technologies in the world, internet users could access the internet with a great number of different kinds of electronic devices such as their smartphones and tablets. By the end of 2020, there are 989 million internet users in Mainland China. Among which, students got the largest share of Internet users in China, accounting for 23.7% of the total number of netizens in the Mainland of China (China Daily 2021; China Internet Network Information Centre, 2020). Moreover, 97.6% of secondary school students in Mainland China (total number around 25 million) have been internet users, and they attributed to 60.9% of internet users who are students according to a national survey (China Internet Network Information Centre, 2019). Needless to say, people could go online to download different data and files from the internet, storing them in various kinds of electronic devices, and making excessive and problematic use of the downloaded data and files offline. According to Block (2008), internet addiction is conceptualized as "a compulsive-impulsive spectrum disorder that involves online and/or offline computer usage" (p.306). Referring to (Starcevic, 2017), "The addiction model of IGD is constraining and does not contribute to a better understanding of the various patterns of problematic gaming." The corresponding diagnostic criteria need a thorough overhaul, which should be based on a model of problematic gaming that can accommodate its disparate aspects". IGD refers to Internet Gaming Disorder. On the other hand, major characteristic symptoms of Internet addiction involve the features and negative costs which are very similar to substance abuse or addiction. For instance, the prolonged excessive compulsive internet use despite choices and efforts to quit, the tolerance, dependence, and withdrawal with physical discomforts, and the school or career failure, the family conflict with parents or spouse, and the loss of friendship, etc. (American Psychiatric Association, 2013; Young, 1998a). Functional magnetic resonance imaging (fMRI) studies repeatedly pointed out that internet addiction shared the neurobiological abnormalities and neurobiological mechanism with some other well-known addiction disorders such as substance use disorder (Ko, et al., 2009). Moreover, brain scans with fMRI shown that psychiatric medication for the treatment of substance abuse could change the brain activity and decrease the craving for internet gaming in internet game addicts similarly in ways that could be observed among the drug-craving addicts (Han, Hwang & Renshaw, 2011). Pertinent literature substantiated the notion that internet addicts jeopardized many aspects of themselves. It has been evidenced that internet addiction leads to psychological problems, social problems, occupational problems, and neurological problems of the addicts (Cash, Rae, Steel, & Winkler, 2012), and psychiatrists worried that internet addiction could turn into the "greatest psychiatric epidemic of all time" (Allen, 2014). Hence, the operational definition of internet addiction would broadly include various online and offline excessive compulsive use of the internet via any electronic device in addition to internet gaming addiction in the study. As psychosocial well-being was negatively associated with symptoms of Internet gaming disorder across 20 countries (Cheng, Cheung, & Wang, 2018), and psychopathy such as alexithymia, depression, anxiety is positively associated with internet gaming disorder in young adults (Bonnaire & Baptista, 2019), the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1975) was adopted to study the association of

psychoticism, neuroticism, extroversion and social desirability with internet addiction in this study.

Current literature indicated that surveys on Internet addiction in the past decade have shown the percentage of Internet addicts generally varies from 1.5% to 8.2% of the sampled population in the United States and countries in Europe (Weinstein & Lejoyeux, 2010). In 2007, it was estimated that approximately two hundred and ten thousand children and adolescents (2.1%; ages 6–19) are Internet-addicted in South Korea while another 1.2 million South Korean children and adolescents (12.0%; ages 6–19) are believed to be at risk of addiction (Block, 2008). Concurrently, about 10 million teenaged Internet users in Mainland China (13.7% of the Chinese adolescents) meet internet addiction diagnostic criteria (Block, 2008). Despite the Government of China began to further restrict the entry of children and adolescents aged under 18 to internet bars and cyber cafes, and proactively regulate prolonged computer game use over 3 hours among those aged under 18 via mandating Internet game operators to install anti-addiction software on their game products by law from 2007 (e.g., Wang, 2007), the epidemic was not stopped. In 2009, the number of Internet-addicted children and adolescents in Mainland China slightly increased to 14.1% and the percentages of Internet Addiction ranged from about 8% in the more developed cities like Beijing and Shanghai to up to around 30% in the less developed cities such as Guiyang and Nanchang (China Youth Association for Network Development, 2010). Since 2012, the Central Government has made the indigenous research, prevention, and intervention of internet addiction in Chinese children and adolescents a national strategy and policy in response to the deteriorating situation among the youths in Mainland China (Xinhua, 2013). Nevertheless, the 26.5% prevalence of internet addiction with severe addiction being 0.96% among Mainland Chinese students between 10 to 18 (Xin, et.al., 2017) and the recent political-economic incidence of a state-run media in Mainland China openly condemned internet gaming as the “spiritual opium” that is greatly jeopardizing children’s education (Shen, Qu & Hu, 2021) have similarly revealed that the addiction problem among Chinese students is cautiously worsening. The research on characteristics and psychopathology of the problematic Internet users in Chinese adolescents is still not thorough enough, in-depth, and multi-faceted investigations to heighten the alertness to and enable the feasibility of prevention of internet addiction in the general public of Mainland China remains highly important and desirable.

An updated review of the existing measuring scales of Internet addiction and their psychometric properties (Laconi, Rodgers, & Chabrol, 2014) concluded that 45 research instruments for internet addiction in 23 different languages were identified in the literature while 17 out of the 45 scales had more than one study evaluating their psychometric properties and that only ten had three or more evaluating studies on their psychometric properties. The big ten well-established measuring scales were listed as follows: (1) the 20-item Internet Addiction Test (IAT) (Young, 1998b) with a 5-point Likert self-reporting scale; (2) the 20-item Internet Addiction Test (IAT) (Young & Nabuco de Abreu, 2011) with a 6-point Likert self-reporting scale; (3) the 14-item Compulsive Internet Use Scale (CIUS) (Meerkerk et al., 2009) with a 5-point Likert self-reporting scale; (4) the 8-item Internet Addiction Diagnostic Questionnaire (IADQ) (Young, 1996) with Yes/No response; (5) the 26-item Chen Internet Addiction Scale (CIAS) (Chen, Weng, Su, Wu, & Yang, 2003) with a 4-point Likert self-reporting scale; (6) the 36-item Online Cognition Scale (OCS) (Davis, Flett, & Besser, 2002) with a 7-point Likert self-reporting scale; (7) the 15-item Generalized Problematic Internet Use Scale 2

(GPIUS-2) (Caplan, 2010) with a 8-point Likert self-reporting scales; (8) the 29-items Generalized Problematic Internet Use Scale (GPIUS) (Caplan, 2002) with an 8-point Likert self-reporting scale; (9) the 18-item Problematic Internet Use Questionnaire (PIUQ) (Demetrovics et al., 2008) with a 5-point Likert self-reporting scale; (10) the 20-item Internet Related Problem Scale (IRPS) (Armstrong, Phillips, & Saling, 2000) with a 10-point Likert self-reporting scale (see Laconi, Rodgers, & Chabrol, 2014, pp.195-197).

Young's Internet Addiction Test (IAT) (Young, 1998b) is the first and the most well-known instrument for the measuring of internet addiction though researchers in the field also acknowledge the observations and input of Ivan Goldberg (e.g., Laconi, Rodgers, & Chabrol, 2014; Shek, Tang, & Lo, 2009). Many measuring instruments in different languages were developed in different countries based on the IAT (Laconi, Rodgers, & Chabrol, 2014). The contribution of Dr. Kimberly Young in the research areas of internet addiction is unprecedented and undeniable. The characteristics and symptoms the IAT looks for are not narrowly restricted to internet gaming addiction only. Nonetheless, this single test might not be able to portray the full picture of internet-related addiction. For instance, Dr. Allen Frances, the chairman of DSM-IV maintained that more research on internet addiction should further investigate what separates internet addiction from a bad habit of internet use (Tinker, 2013). Therefore, the instruments such as the Adolescent Internet Use Questionnaire (Ma, Li & Pow, 2011) could supplement the desirable data in this aspect because it was developed based on the Adolescent Behavior Questionnaire (ABQ) (Ma, 1988), a well-established self-reporting questionnaire that measures the frequency of a variety of real-life pro-social behaviors, neutral behaviors, and anti-social behaviors in adolescents. Without timely revision, the sensitivity of IAT to internet-related addiction could diminish after nearly two decades. For example, the IAT asks the subjects "how often do you check your email before something else that you need to do?" In our world today, most people may not even be adequately informed about the things they need to do if they do not check emails before they start to work each morning in the day. According to a clinical study on internet addiction (Kim, Park, Ryu, Yu, & Ha, 2012), the IAT was queried as having limited clinical utility because only around 40% of the clinically diagnosed internet addicts who participated in the study were successfully detected and identified by the IAT. The study suggested that no significant association between IAT scores and the stages and forms of their internet addiction (i.e., course of the disease) was evident, and an insignificant association was only found between the IAT scores of the internet addicts and their differential severity of the addiction. It was suggested that some other popular research instruments for internet addiction such as Ko's Internet Addiction Scale (Ko, Yen, Chen, Chen, & Yen, 2005) and the Chen Internet Addiction Scale (CIAS) (Chen, Weng, Su, Wu, & Yang, 2003) could serve the purpose of reliable identification when the study is targeted for internet-related addiction but not limited to internet gaming addiction. We, therefore, chose Young's IAT in this study because of its popularity and impact in the study of internet addiction. In addition, we also chose CIAS because of its relevance to the Chinese situation. In addition, the Adolescent Internet Use Questionnaire (AIUQ) (Ma, Li & Pow, 2011) was adopted in this study to measure the self-perception and social behaviours in cyberspace, and negative outcomes in the daily life of adolescents that are associated with generalized problematic internet use.

The major aim of the present study is to investigate the relationship between personality traits such as psychoticism, neuroticism, extroversion, social desirability, and self-concept with

Internet addiction and Internet social behavior (prosocial and antisocial behavior). Based on the above literature review, we set up the following hypotheses.

Hypothesis1:

- a) Internet addiction is positively associated with psychoticism.
- b) Internet addiction is positively associated with neuroticism.
- c) Internet addiction is negatively associated with social desirability.
- d) Internet addiction is negatively associated with self-concept
- e) Internet addiction is positively associated with Internet use.

Hypothesis 2:

- a) Holistic Internet social behavior is positively associated with extroversion.
- b) Holistic Internet social behavior is negatively associated with psychoticism.
- c) Holistic Internet social behavior is negatively associated with neuroticism.
- d) Holistic Internet social behavior is positively associated with social desirability.
- e) Holistic Internet social behavior is positively associated with self-concept.
- f) Holistic Internet social behavior is positively associated with Internet use.

Holistic Internet Behavior (HIU) is measured by (NIU – DIU). A high score of HIU means a high score of prosocial Internet behavior and a low score of delinquent Internet behavior, whereas a low score of HIU means a low score of prosocial Internet behavior and a high score of delinquent Internet behavior. We did not set up any hypothesis on the relation between Internet addiction and extroversion because there is not clear-cut literature on this topic. We have left it to be addressed by a research question instead.

METHODS

Participants

Three hundred and eighty-two Grade 10 students (195 boys and 187 girls) from two secondary schools in Jiangsu Province of Mainland China participated in this quantitative study. The mean of age is 16.44 and 4 research instruments which included Young's Internet Addiction Test (YIAT), Chen Internet Addiction Scale (CIAS), Ma, Li & Pow's Adolescent Internet Use Questionnaire (AIUQ), and the Revised Short Version of Eysenck Personality Questionnaire for Chinese (EPQ-SRC) were used to measure aspects of the characteristics and psychopathology of the problematic internet users among the participating Chinese adolescents.

Instruments***Young's Internet Addiction Test (YIAT)***

The IAT was used to measure the degree of internet addiction among the participating Chinese adolescents. It is a 20-item Internet Addiction Test (YIAT) (Young, 1998b) with a 5-point Likert self-reporting scale (ranging from 0 = not applicable to 5 = always). For example, the IAT asks the subjects "how often do others in your life complain to you about the amount of time you spend online?" and "how often do you become defensive or secretive when anyone asks you what you do online?" An extensive review of the existing measuring scales of Internet addiction and their psychometric properties (Laconi, Rodgers, & Chabrol, 2014) ranked the IAT as the first of the big ten well-established measuring scales in the research area. The use of IAT should enable a convenient cross-cultural comparison of the results of this study.

Chen Internet Addiction Scale (CIAS)

The Chen Internet Addiction Scale (CIAS) (Chen, Weng, Su, Wu, & Yang, 2003) consists of five subscales (compulsive use, withdrawal, tolerance symptoms of Internet addiction, interpersonal and health-related problems, and time management problems) was also employed to measure the degree of internet addiction in terms of the core symptoms and related problems of Internet addiction among the participating Chinese adolescents. It is a 26-item with a 4-point Likert self-reporting scale (ranging from 1 = does not match my experience at all to 4 = definitely match my experience). For example, the CIAS asks the subjects “more than once, I have slept less than four hours due to being online” and “my life would be joyless without the Internet”. Other than the reasons that it was ranked the fifth of the big ten well-established measuring scales in the research area (Laconi, Rodgers, & Chabrol, 2014) and it was and was developed with studies in the Chinese population (Chen et al, 2003), it was also suggested to be one of the more sensitive instruments which are of higher clinical utility that could satisfactorily identify the internet addicts and their differential severity of the addiction as well (Kim, Park, Ryu, Yu, & Ha, 2012).

Ma, Li & Pow's Adolescent Internet Use Questionnaire (AIUQ)

The Adolescent Internet Use Questionnaire (Ma, Li & Pow, 2011) was developed based on the Adolescent Behavior Questionnaire (ABQ) (Ma, 1988), and a well-established self-reporting questionnaire that measures the frequency of a variety of real-life pro-social behaviours, neutral behaviours, and anti-social behaviours in adolescents. This 43-item AIUQ is a comprehensive questionnaire that also measures the cognition, behaviors, and negative outcomes associated with Davis's (2001) concept of generalized Pathological Internet Use. The internal consistency reliabilities of the major indices of the AIUQ were in the range of .84 to .88, and the predictive validities were also good (Ma, Li, & Pow, 2011). In this study, only two scales of the AIUQ were used: the Normal or Prosocial Internet Use and the Delinquent Internet Use. The two scales measured the prosocial and antisocial/delinquent behavior of adolescents in the virtual internet world and revealed their prosocial and antisocial internet use. Participants were asked to rate the items on a 5-point Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree). For example, the Normal or Prosocial Internet Use Scale (NIU) asked “I would use the net when I'm down” and “I seek others online when I feel isolated”, and the Delinquent or Antisocial Internet Use Scale (DIU) asked “I have gambled on the Internet” and “I have missed family and school meetings because of online activities”. Moreover, scores of the Holistic Internet Use Scale (HIU) were generated using the formula $HIU = NIU - DIU$. A high (low) rating of HIU refers to a high (low) rating of NIU and a low (high) rating of DIU, and vice versa. In other words, a high value of HIU means more prosocial and less antisocial use of the Internet; a low value of HIU refers to less prosocial and more antisocial use of the Internet. PAT (Total score of the perceived Internet activities) measures the frequency of various Internet activities such as surfing, email, blogging, and Internet purchase. PLT (Total score of the perceived self-concept in daily life) measures one's self-concept in real life such as “I am a reliable and honest person in other people's eyes” and “I like the I in real life”.

Eysenck Personality Questionnaire (EPQ-RSC)

While most subjects took the first three questionnaires, only about one-third of the sample took the Eysenck Personality Questionnaire (Short Form Revised Chinese Version, EPQ-RSC). The 48-item EPQ-RSC (Qian, Wu, Zhu, & Zhang, 1999) was adapted based on the revised 48-item short version of the Eysenck Personality Questionnaire (EPQ-R Short Scale) to assess one's

personality traits. In the same line with EPQ-R (Eysenck, Eysenck, & Barrett, 1985), there are four scales in EPQ-RSC: Extraversion vs. Introversion (E), Neuroticism or emotionality (N), Psychoticism or toughmindedness (P), and Lie (L) or social desirability. The EPQ-RSC measures the four aspects of personality accordingly. For example, the Extraversion vs. Introversion (E) scale asks "Are you a talkative person?", the Neuroticism or emotionality (N) scale asks "Are you feeling easily hurt", the Psychoticism or toughmindedness (P) scale asks "Do you try not to be rude to people?", and Lie (L) or social desirability asks "Have you ever cheated at a game?" The Eysenck Personality Questionnaire (Short Form Revised Chinese Version) was standardized with the participations of 8637 subjects and a big team of psychologists in Mainland China (Qian, Wu, Zhu, Zhang, 2002) and the internal consistency reliabilities of these four scales ranged from .61 to .88 (p.321) and was concluded as a valid and reliable psychological instrument for Chinese.

Procedure

The questionnaires were group-administered to participants during their normal class period. The experimenter went through the test instruction with the participating secondary school students before they answered the questions.

RESULTS

The means and standard deviations of the test scores by sex are presented in Table 1. The mean CIAS, YIAT, NIU, DIU, and PAT scores for boys were significantly higher than those for girls. In other words, the degree of internet addiction of boys is higher than that of girls. In addition, as far as prosocial internet behavior, antisocial internet behavior, and the use of the internet are concerned, boys also scored significantly higher than girls. On the other hand, the mean L score for girls was significantly higher than that for boys.

Table 1. Mean and SD of test scores

Score	Total Sample		Boy		Girl		<i>t</i>
	M	SD	M	SD	M	SD	
Chen Internet Addiction Scale (N = 368; 185 boys, 183 girls)							
CIAS	2.30	.27	2.34	.30	2.27	.22	2.353*
Young's Internet Addiction Scale (N = 368; 185 boys, 183 girls)							
YIAT	2.05	.65	2.15	.67	1.95	.61	2.923**
Ma, Li & Pow's Adolescent Internet Use Questionnaire (N = 368; 185 boys, 183 girls)							
NIU	3.22	.51	3.28	.56	3.16	.44	2.417*
DIU	1.76	.44	1.83	.46	1.70	.41	2.800**
PLT	3.46	.65	3.44	.72	3.48	.58	-.583
PAT	2.48	.44	2.54	.44	2.42	.43	2.588*
Eysenck Personality Questionnaire (N = 123; 60 boys, 63 girls)							
E	.64	.22	.60	.25	.66	.19	-1.520
P	.20	.15	.23	.16	.18	.15	1.784
N	.53	.28	.51	.27	.56	.29	-.995
L	.41	.24	.35	.24	.46	.23	-2.584*

Note. The number of cases for PLT is 367, with one missing.

***p < .05. **p < .01.**

The number of cases in the correlations of CIAS with YIAT, NIU/DIU, E/P/N/L, and PLT is 368, 381, 127, and 367. The number of cases in the correlations of YIAT with NIU/DIU, E/P/N/L, and

PLT is 369, 124, and 368. The number of cases in the correlations of NIU/DIU with E/P/N/L, and PLT is 123, and 367.

The correlations of the personality (E, P, N, L), PLT, and PAT scores with the Internet Addiction (CIAS, YIAT) and Internet Social Behavior (NIU, DIU, HIU) scores are given in Table 2. The correlations of the CIAS and YIAT with N and PAT were significant and positive, and the correlations of CIAS and YIAT with L and PLT were significant and negative. In addition, the correlation of YIAT with P is also significant and positive. The correlations of NIU with E, PLT, and PAT were significant and positive. The correlations of DIU with P, N, and PAT were significant and positive, and the correlations of DIU with L and PLT were significant and negative. The correlations of HIU with E, L, PLT, and PAT were significant and positive, and the correlations of HIU with P and N were significant and negative.

In addition, the correlations of CIAS with YIAT, NIU, DIU and HIU were .52 ($p < .001$), .09, .39 ($p < .001$), -.22 ($p < .001$), and the correlations of YIAT with NIU, DIU and HIU were .24 ($p < .001$), .63 ($p < .001$), -.22 ($p < .001$). The correlations of NIU with DIU and HIU were .15 ($p < .01$) and .71 ($p < .001$), and the correlation of DIU with HIU was -.59 ($p < .001$).

Table 2. Correlations of Internet Addiction and Internet Social Behavior Scores with other Test Scores

Score	E	P	N	L	PLT	PAT
CIAS	-.02	.15	.35***	-.51**	-.33***	.15**
YIAT	-.09	.32***	.34***	-.63***	-.32***	.29***
NIU	.29**	.01	-.15	-.05	.30***	.44***
DIU	-.10	.29**	.22*	-.61***	-.30***	.25***
HIU	.28**	-.23*	-.29**	.47***	.46***	.19***

* $p < .05$. ** $p < .01$. *** $p < .001$.

Six multiple regression analyses were conducted with P, E, N, L, PLT, and PAT as dependent variables. The following scores were entered as independent variables for each multiple regression analysis: CIAS, YIAT, NIU, and DIU. The results are presented in Table 3. The findings indicated that the CIAS, YIAT, NIU, and DIU are good predictors of each of the dependent variables (P, E, N, L, PLT, and PAT). In particular, the regression of L, PLT, and PAT on the four independent variables are robust and very significant. The results also showed that internet addiction and internet social behavior are good predictors of extroversion (E), psychoticism (P), and neuroticism (N).

Table 3. Multiple Regression of the Personality Scores on the Internet Addiction and Internet Social Behavior Scores

Independent Variable	B	SE	β	t	Significance of F , R , R^2 , and Adjusted R^2
Dependent Variable : P ($n = 123$)					
CIAS	-.099	.072	-.164	-1.377	$F(4, 118) = 4.730$ ($p < .001$) $R = .372$ $R^2 = .138$ Adjusted $R^2 = .109$
YIAT	.076	.028	.347	2.686**	
NIU	-.020	.036	-.048	-.548	
DIU	.054	.041	.160	1.307	
Dependent Variable : N ($n = 123$)					
CIAS	.307	.124	.281	2,473*	$F(4, 118) = 7.895$ ($p < .001$) $R = .459$ $R^2 = .211$ Adjusted $R^2 = .184$
YIAT	.113	.049	.286	2.314*	
NIU	-.179	.061	-.243	-2.909**	
DIU	-.070	.071	-.115	-.987	
Dependent Variable : E ($n = 123$)					
CIAS	.066	.103	.077	.643	$F(4, 118) = 3.880$ ($p < .01$) $R = .341$ $R^2 = .116$ Adjusted $R^2 = .086$
YIAT	-.051	.040	-.165	-1.262	
NIU	.185	.051	.321	3.625***	
DIU	-.034	.059	-.072	-.585	
Dependent Variable : L ($n = 123$)					
CIAS	-.113	.088	-.121	-1.280	$F(4, 118) = 24.769$ ($p < .001$) $R = .676$ $R^2 = .456$ Adjusted $R^2 = .438$
YIAT	-.109	.035	-.322	-.3132**	
NIU	.047	.044	.074	1.065	
DIU	-.172	.051	-.328	-3.384**	
Dependent Variable : PLT ($n = 367$)					
CIAS	-.475	.124	-.193	-3.833***	$F(4, 362) = 39.455$ ($p < .001$) $R = .551$ $R^2 = .304$ Adjusted $R^2 = .296$
YIAT	-.260	.060	-.257	-4.337***	
NIU	.515	.059	.398	8.765***	
DIU	-.189	.082	-.127	2.300*	
Dependent Variable: PAT ($n = 368$)					
CIAS	.040	.087	.024	.463	$F(4, 363) = 28.478$ ($p < .001$) $R = .489$ $R^2 = .239$ Adjusted $R^2 = .230$
YIAT	.076	.042	.111	1.798	
NIU	.347	.041	.397	8.360***	
DIU	.110	.058	.110	1.906	

DISCUSSION

Sex Differences in Internet Addiction, Internet Social Behavior, and Personality Traits

Results indicated that boys scored significantly higher than girls in the two internet addiction (CIAS and YIAT) questionnaires. It was quite a clear cut in this study and was very much agreed with previous studies in internet gaming addiction in Chinese and other cultures (e.g., Tsitsika et al., 2014; Xin, et.al., 2017). In addition, boys scored higher than girls in the delinquent internet behavior score and the use of the internet which is in good agreement with previous findings by Ma, Li and Pow (2011), Ma, Shek, Cheung & Lee (1996), and Ma (2005). On the other hand, girls scored higher than boys in social desirability (L) score which is also similar to a previous study in Hong Kong (Ma, Shek, Cheung, & Lee, 1996). Overall, it seems that boys tend to be more internet-addicted, more antisocial, and less socially desirable than girls. On the other hand, boys have reported a slightly and significantly higher frequency of Internet Prosocial Behavior (NIU) in this study, and that is a bit at odds with the social expectation of Chinese girls

as the more obedient and well-behaved non-troublemakers from the early years (e.g., Chen & Rao, 2011). However, this unexpected finding of gender difference in internet prosocial behaviours is consistent with the non-significant gender difference in real-life prosocial behaviours between Chinese boys and girls (e.g., Ma, 2005; Ma, Shek, Cheung & Lee, 1996). Overall speaking, the Chinese boys tended to outperform Chinese girls in the internet world by acting more actively and prosocially, but are more at risk of trouble-making by acting more antisocially in cyberspace at the same time. These findings should be followed up in future studies.

Correlation Analyses

The correlations of two internet addiction scales with Eysenck's Personality Scores are given in Table 2. Results indicated that the correlations of YIAT with P and N were .32 and .34 (both with $p < .001$); the correlation of CIAS with N was also .35 ($p < .001$). In addition, the correlations of CIAS and YIAT with L were -.51 and -.63 (both with $p < .001$). Internet addiction is found to be significantly and positively associated with neuroticism and psychoticism, but negatively associated with the Lie score (social desirability). The present findings indicated that internet addiction is associated with negative personality (Allen, 2014; Block, 2008; Bonnair & Baptista, 2019; Cash, Rae, Steel, & Winkler, 2012; Cheng, Cheung, & Wang, 2018; Park et al., 2013). The present findings supported the following hypotheses: 1(a) Internet addiction is positively associated with psychoticism, 1(b) Internet addiction is positively associated with neuroticism, and 1(c) Internet addiction is negatively associated with social desirability. In addition, the correlation of CIAS and YIAT with PLT were -.33 and -.32 (both with $p < .001$), and with PAT were .15 ($p < .01$) and .29 ($p < .001$). The findings supported the hypothesis: 1(d) Internet addiction is negatively associated with self-concept, and 1(e) Internet addiction is positively associated with Internet use.

The P and N scores correlate with DIU positively and significantly and with HIU scores negatively and significantly. That is, delinquent internet behavior is related to psychoticism (P) and neuroticism (N). Extroversion (E) is positively related to normal/prosocial internet behavior (NIU) and holistic Internet Behavior (HIU). In addition, Social desirability (Lie score) is negatively related to DIU and positively with HIU, which is logical. The findings supported the following hypotheses: 2(a) Holistic Internet social behavior is positively associated with extroversion, 2(b) Holistic Internet social behavior is negatively associated with psychoticism, 2(c) Holistic Internet social behavior is negatively associated with neuroticism, and 2(d) Holistic Internet social behavior is positively associated with social desirability.

PAT only correlated with L, but PLT correlated significantly with all the scores, positively with E and L and negatively with P and N. In addition, HIU correlated positively and significantly with PLT and PAT; which supported the following two hypotheses: 2(e) Holistic Internet social behavior is positively associated with self-concept, and 2(f) Holistic Internet social behavior is positively associated with Internet use.

Finally, the correlations of two internet addiction scales (CIAS and YIAT) with prosocial and antisocial behavior in cyberspace (NIU and DIU) are also given in the Result section. Results indicated that the correlations of CIAS and YIAT with DIU were .39 and .63 (both with $p < .001$). In other words, Internet addiction measured by CIAS and YIAT was found to be significantly and positively associated with the delinquent use of the internet (DIU). In addition, Young's

internet addiction score (YIAT) also associated significantly and positively with prosocial internet use (NIU) ($r = .244$, $p < .001$), but the strength of association between internet addiction and delinquent internet use is much stronger than that between internet addiction and prosocial internet use.

Multiple Regression Analysis

We have conducted six multiple regression analyses with each of the following variables as dependent variables: P, N, E, L, PLT, and PAT. The following variables were entered as independent variables: CIAS, YIAT, NIU, and DIU. The percentage of variances of P, N, E, L, PLT, and PAT explained by the four independent variables (CIAS, YIAT, NIU, DIU) were 13.8%, 21.1%, 11.6%, 45.6%, 30.4%, and 23.9%. The overall result of each of the regression analyses indicated that the regressions of each of the dependent variables on the four independent variables fitted nicely because all F-ratios are significant at $p < .001$ except with E where $p < .01$. In summary, our findings indicated that the Internet addiction scores (CIAS and YIAT) and Internet social behavior scores (NIU and DIU) predicted quite well the personality trait scores (P, N, E, L, and PLT) and Internet use score (PAT). This finding lays a sound foundation for future studies on the relation of Internet Behavior and personality trait.

CONCLUSION

The present findings indicated that there are sex differences in internet addiction in favor of boys. Boys also scored higher in the Prosocial and Antisocial Internet Behaviour than girls. The findings supported the argument that boys tend to spend more time in the use of the internet and usually in a more negative way in comparison with girls (Ma, Li, & Pow, 2011). As suggested by the literature that the gender-related cultural values significantly affect the psychopathology of internet addiction (Cheng, Cheung, & Wang, 2018), future studies should be conducted to further investigate how gender-role identity affects internet addiction, anti-social internet behaviour, and prosocial internet behaviour in different cultures.

The present results supported the following hypotheses: 1(a) Internet addiction is positively associated with psychoticism, (b) Internet addiction is positively associated with neuroticism, (c) Internet addiction is negatively associated with social desirability, (d) Internet addiction is negatively associated with self-concept, and (e) Internet addiction is positively associated with Internet use; and 2(a) Holistic Internet social behavior is positively associated with extroversion, (b) Holistic Internet social behavior is negatively associated with psychoticism, (c) Holistic Internet social behavior is negatively associated with neuroticism, (d) Holistic Internet social behavior is positively associated with social desirability, (e) Holistic Internet social behavior is positively associated with self-concept, (f) Holistic Internet social behavior is positively associated with Internet use.

Future studies should include the following: (1) More personality traits such as loneliness, depression, and gender role identity should be investigated, (2) longitudinal studies should be conducted to find out the possible causes of Internet addiction in children and adolescents, (3) cross-cultural studies should be carried out to see whether culture is a significant factor in explaining the development of Internet addiction, (4) enhancement of self-concepts as a prevention and intervention strategy for internet addiction in adolescents.

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