Prevalence and Determinants of Pathological Internet Use among Undergraduate Students in a Public University in Malaysia

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Pathological Internet Use (PIU) affects one's physical and mental health, and university students are at risk as they are more likely to develop PIU. This study determines the prevalence of PIU and its associated factors among students in a public university in Malaysia. This cross-sectional study was conducted among 1023 undergraduate students in 2015. The questionnaire comprised of items from the Young's Diagnostic Questionnaire to assess PIU and items related to socio-demography, psychosocial, lifestyle and co-morbidities. Anonymous paper-based data collection method was adopted. Mean age of the respondents was 20.73 ± 1.49 years old. The prevalence of pathological Internet user was 28.9% mostly Chinese (31%), 22 years old and above (31.0%), in Year 1 (31.5%), and those who perceived themselves to be from family from higher socio-economic status (32.5%). The factors found statistically significant ($p<0.05$) with PIU were Internet use for three or more hours for recreational purpose (OR: 3.89; 95% CI:1.33 – 11.36), past week of Internet use for pornography purpose (OR: 2.52; 95% CI:1.07 – 5.93), having gambling problem (OR: 3.65; 95% CI:1.64 – 8.12), involvement in drug use in the past 12 months (OR: 6.81; 95% CI:1.42 – 32.77) and having moderate/severe depression (OR: 4.32; 95% CI:1.83 – 10.22). University authorities need to be aware of the prevalence so that interventions can be developed to prevent adverse outcomes. Interventions should focus on screening students for PIU, creating awareness on the negative effects of PIU and promoting healthy and active lifestyle and restricting students' access to harmful websites.

Keywords: internet addiction, prevalence, risk factors, tertiary students, Malaysia

In this digital world, the growing Internet use has led to problematic behavior such as excessive use and several terms have been coined to describe such behavior such as Internet addiction (IA), Internet dependence, problematic Internet use, compulsive Internet use, pathological Internet use (PIU), excessive Internet use (Rial Boubeta et al. 2015). PIU is when a person has excessive or poorly-controlled preoccupations, urges or behaviors related to Internet use resulting in impairment and distress to their life (Shaw & Black, 2008).

In the 5th edition of the Diagnostic and Statistical Manual of Mental Disorder (DSM-5), the American Psychiatric Association (APA, 2012) has included Internet Use Disorder as their clinical diagnosis. In this paper, PIU is used to define someone with Internet problem with a potentially pathological behavioral problem and does not refer to a clinical diagnosis, since the instrument used in this study to assess Internet problem is based on a screening tool. Also PIU is a preferred term as compared to IA where the latter refers to dependency on psychoactive substances (Davis, 2001).

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Currently, most studies on PIU have been focused largely in Europe and US where PIU has been a prominent issue in the adolescent health literature. Internet addiction has become more prevalent in Asia than in other parts of the world (Yen, Yen, & Ko, 2010). In a meta-analysis of 31 nations across seven world regions, the global prevalence of Internet addiction was 6.0% (Cheng & Li, 2014). In East Asian countries, most studies were from Taiwan, China, Korea and Singapore, however, literature are scarce in other Asian counterparts (Kuss, Griffiths, & Binder, 2013; Lam, 2014). In Asia, there is higher variation in prevalence among young people and adolescents, ranging from 8% to 50.9% (Kim et al., 2006; Mak et al., 2014). In China, the rates ranged from 6% to 26.5% (Cao et al., 2011, Lai et al., 2013, Wu et al., 2013, Chi, Lin & Zhang, 2016; Xin et al., 2018). In one study among adolescents in six Asian countries, namely China, Hong Kong, Japan, South Korea, Malaysia and the Philippines, there were variations in internet behaviors and addiction across these countries (Mak et al., 2014). Further, the study found that the prevalence of addictive Internet use ranges from 1% in South Korea to 5% in the Philippines, and the prevalence of problematic Internet use ranges from 13% in South Korea to 46% in the Philippines, as measured by the Internet Addiction Test (IAT). Further, based on the Revised Chen Internet Addiction Scale (CTAS-R), the prevalence of addictive Internet use in the six countries are as follows: Philippines (21%), Hong Kong (16%), Malaysia (14%), South Korea (10%), China (10%) and Japan (6%) (Mak et al., 2014). Elsewhere, a cross-sectional study in five ASEAN countries (Indonesia, Malaysia, Myanmar, Thailand and Vietnam), the overall prevalence of pathological Internet use was 35.9% (ranging from 16.1% in Myanmar to 52.4% in Thailand), maladaptive use 34.8% and adjusted Internet users 29.9% (Turnbull et al., 2018). Among these five ASEAN countries, the highest prevalence of pathological Internet use is Thailand (52.4%) followed by Indonesia (38.5%), Vietnam (37.5%), Malaysia (28.9%), and Myanmar (16.1%) (Turnbull et al., 2018). Other parts of Asia, in Nepal among undergraduate students, the prevalence rate of Internet addiction was 35.4% (Bhandari et al., 2017). In Japan, among junior and high school students, the prevalence of Internet addiction was 8.1% (Marioka et al., 2017), in South India, among 2776 University students, the prevalence was 29.9% for mild Internet addiction, 16.4% for moderate addictive use and 0.5% for severe Internet addiction (Anand et al., 2018). In Asia, Internet use is indeed a problematic issue, and a public health concern.

Malaysia, a multiethnic country located in Southeast Asia, is not without its negative consequences of technological advancement. As the country becomes more advanced, developed, and technologically savvy, this comes with a price. Based on the Malaysian Communication and Multimedia Commission (MCMC), Internet addiction among Malaysians has reached an alarming rate. According to the MCMC (2017), smartphones are the most common device to access the Internet (89.4%), with 57.4% of users being male, and 67.2% being from urban areas. Additionally, 83.2% of children aged 5 – 17 use the internet. In the Malaysian Internet User survey (MCMC, 2015), university/college students comprised of 62.5% of internet users who were schooling. 80% accessed the web for social media usage with the average usage period being over four hours a day, and 89% were found to be addicted to the Internet. Further, 60% of the respondents showed elevated levels of anxiety and 32% suffered from major depression. These findings are a cause for concern with negative implications for the individual, family and the community.

Other local Malaysian studies also showed a variation in the prevalence rates of Internet addiction due to the methodology employed. Cheng and Li's (2014) meta-analysis of 31 nations across seven regions in the world, among 12-18 years old adolescents, 2.4% of Malaysian adolescents were reported being addicted to Internet, and 35.1% were found having problematic Internet use. In one study among secondary school students, 28.6% of the respondents were addicted to the Internet (Mohd Isa, Hashim, Kaur, & Ng, 2016). Yet, in another study among undergraduate students in a public university, the prevalence of Internet addiction was 7.8% and 56.5% were problematic Internet users (Rosliza, Ragubathi, Mohamad Yusoff, & Shaharuddin, 2018). Zainudin, Md Din, & Othman, (2013) also in their study among undergraduate students, found 30% prevalence of excessive Internet users. Among local medical students, a study showed a prevalence of 36.9% Internet addiction (Ching et al., 2017). As to the impact of Internet addiction on young Malaysian adults, (Alam et al., 2014) showed those adults using Internet excessively were having problems, such as, interpersonal, behavioral, physical, psychological and work problems in their daily lives.

Internet addiction in adolescents and young adults has become a public health issue and has an impact on health education and health promotion. Excessive and inappropriate use of the Internet can pose serious negative consequences on one's mental health and quality of life (Kuss & Griffiths, 2012, Alam et al., 2014). Thus, this paper examined the prevalence of pathological internal use among university students in Kuala Lumpur and its associated factors. It is hypothesized that pathological Internet use is associated with socio-demographic factors, gender, age, life satisfaction, time spent on Internet, Internet use patterns, history of child abuse and other psychosocial factors. The literature reviewed will further illustrate the relationship between pathological Internet use and its various associated factors.

Literature Review

There are many factors associated with Internet use, such as sociodemographic variables, such as gender, time spent online, psychosocial factors, life satisfaction, and history of child abuse and other comorbid symptoms, such as depression, harmful substance abuse and sleeping disorder. Socio-demographic factors such as gender, family socio-economic status, types of residence; duration of Internet use for study or recreational purpose; psychosocial factors such as low academic achievement, low life satisfaction; and comorbid symptoms such as alcohol and substance use and depression have been associated with PIU in adolescents and young people (Kuss, Griffiths, Karila, & Billieux, 2014, Turnbull et al., 2018). Bozogplan, Demirer, & Sahin, (2013) found that loneliness, self-esteem and life satisfaction explained 38% of the total variance in Internet addiction.

A number of studies have shown that the male gender is more susceptible to Internet addiction (Carli et al., 2013; Anand et al., 2018). Anand et al. (2018) in their study among undergraduate students, aged 18-21 years old in South India found that IA was higher among male students, i.e. 2.8 times at a higher risk of engaging IA. One study among school adolescents in China, showed that mild and severe IA was significantly higher in boys than in girls (Xin et. al., 2018). Among Malaysian medical students, the male students were 1.8 times more at risk of Internet addiction (Ching, et al., 2017). College and University students are more susceptible to PIU (Kim, Griffiths, Lau, Fong, & Lam, 2013; Ozcan, & Buzlu, 2007; Chi, Lin, & Zhang, 2016) due to reasons such as early exposure to the Internet, lack of parental supervision, the availability and free access to the Internet at the university campus,

the need to use Internet to perform academic activities (Ko, Yen, Chen, Chen, & Yen, 2008) to cope with anxiety, depression, and stress of university's life (Hicks & Heastie, 2008) and, for social networking (van Rooij, Schoenmakers, van de Eijnden, & van de Mheen, 2010). The quality of the family environment and parent-child relationships were also shown to be linked to Internet addiction (Chi, Lin, & Zhang, 2016). The excessive use of the Internet has also impacted on students' academic performance and social interaction (Yen, Yen, & Ko, 2010; Durkee et al., 2016; Turnbull et al., 2018).

Internet use pattern is also something to reckon with, as the pattern varies from study to study. Mak et al., (2014) in their six Asian countries epidemiological study of Internet behaviors among adolescents aged 12-18 years old, found that emails (66%), instant messages (50%), blogging (25%), and visiting leisure web sites (20%) are relatively more common in Japan, whereas social networking (65%), newsgroup/discussion groups/forums (19%), non-purposive web surfing (27%), online shopping (8%), and downloading (28%) are relatively more common in Hong Kong. In Malaysia, most common are for social networking (38%), followed by online gaming (19%), downloading (19%), web surfing (14%), visiting leisure websites (13%), email (12%), listening to online radio (10%), Instant messenger (9%), and others (Mak et al., 2014). In another ASEAN study of 5 countries among undergraduate students (Turnbull et al., 2018), it was found that among those with PIU, overall Internet usage was more than 5 hours/day, followed by Internet use for recreation purposes (more than 3 hours/per), Internet for pornography, Smartphone use, and Internet use for study purposes. It is obvious that students use the Internet for a variety of purposes. A Malaysian study on medical students found that the use of Internet was mainly for entertainment purposes, followed by education and the mixture of both entertainment and education purposes (Ching, et al., 2017). Based on the recent Internet Users Survey 2017 (MCMC, 2017), text communication (96.3%) and visiting social network site (89.3%), were the most common activities for Internet users as well as getting information online (86.9%).

A study among Hong Kong and Macau university students have reported that having more liberal sexual attitudes, stronger perception that sex is as an instrument for biological needs, poor attitudes towards contraception and ever had sexual experience were significantly associated with PIU (Ding et al., 2016). Childhood trauma particularly physical and emotional abuse significantly increases risks of developing PIU (Zhang et al., 2009; Dalbudak, Evren, Aldemir, & Evren, 2014; Turnbull et. al., 2018). Furthermore, adolescents who had experienced sexual abuse showed lower self-esteem, more depressive symptoms, and greater problematic Internet use compared to adolescents who have not experienced sexual abuse (Kim, Park, & Park, 2017). Childhood abuse has also been related to post-traumatic stress disorder (PTSD) (Ginzburg et al., 2009; Hsieh et al., 2016). People who have experienced traumatic events may use avoidance as a means to cope with their negative memories and emotions and one way to do that is to use the Internet as distraction and this may lead to addiction.

PIU has impact on physical and psychological health due to poorer diet, less regular exercise, sedentary activities, less sleep (Kim & Chun, 2005, Mak et al. 2014) resulting in obesity (Mak et al., 2014; Tsitsika et al., 2016), lower self-perceived immune function (Reed, Vile, Osborne, Romano, & Truzoli, 2015) and health status; as well as mental problems such as depression, social anxiety, attention-deficit hyperactive disorder and psychosocial well-being (Ko, Yen, Yen, Chen, & Chen, 2012; Lai et al., 2015; Mak et al 2014; Sung, Noh, Park, & Ahn 2013). Co-morbid symptoms, such as, gambling problem, harmful use of alcohol,

drug use in the past 12 months, mental distress, e.g. severe depression, PTSD symptoms, sleeping problems and suicidal attempts, are also related to PIU (Turnbull et al. 2018). Carli et al., (2013) and Yen et al., (2007) suggest that depression is a leading comorbid disorder with IA. Individuals with negative self-esteem are at risk of engaging in addictive Internet behaviors which helps to momentarily free themselves of their negative self-esteem, irrational cognitive assumptions and associated unpleasant emotions (Griffiths, 2000). Thus, one way of relieving stress among university students is by interacting with their computers, and this works as a coping mechanisms for them.

PIU is indeed a very complex issue and can manifest itself in a pathological, behavioral and emotional way and there are also many theories that explain PIU. Among others, is the cognitive-behavioral model of pathological Internet use proposed by Davis (2001) to explain the etiology of this phenomenon. This model emphasizes the individual's cognitions (or thoughts) as the main source of abnormal behavior, and these cognitive symptoms (e.g. feeling of self-consciousness, low self-esteem, low self-worth, social anxiety, etc.) of PIU often precede and cause the affective or behavioral symptoms. Thus, the etiological factor must be present or must have occurred in order for the symptoms to occur (in this case, the Internet use). So, the maladaptive cognitions (e.g. distorted thoughts and the thought processes) are sufficient to cause the symptoms of PIU, such as, the obsessive thoughts about Internet usage, or having less time to do other things, etc. (Davis, 2001). This model is important to explain the role of cognitions in PIU.

In view of the literature above, it is thus important to determine the extent of PIU and its associated factors so that interventions can be developed to prevent the onset of negative consequences of PIU among university students who are the future policy makers of a nation. Therefore, this study begs the research questions as to how serious is PIU in Malaysia among University students, and how the various socio-demographic factors, psychosocial issues, Internet use patterns, history of child abuse, and co-morbid conditions are affected by PIU. It is also hypothesized that the socio-demographic variables together with the various psycho-social variables are related to PIU.

Objectives

This study aimed (1) to determine the prevalence of PIU using the Young's Diagnostic Questionnaire (Young, 1998), where the diagnosis of PIU was established when there is a score of ≥ 5; and (2) to determine the associated factors pertaining to socio-demography (age, gender, perceived income status, academic performance), post-traumatic stress disorder, history of child abuse, Internet use patterns and co-morbid symptoms using logistic regression.

Methods

Study Design and Sampling

This cross-sectional study was conducted between July to September 2015 among Malaysian undergraduate students in a public university in Kuala Lumpur. The particular university in this study was purposely selected because it is the premier university in the country. University students were chosen as the literature review has shown that this is the age group that are most vulnerable, being Internet savvy and frequently exposed to

communications via social media. The total undergraduate student body at the time of study was 11,908 from 16 faculties, 2 centers and 2 academies. A stratified cluster sampling was used to draw the sample. All the faculties, centers and academies formed the clusters and were included in the sampling frame. Within each cluster, the student populations were stratified by gender in order to obtain equal representation of both males and females. The number of students selected from each cluster are proportional to size. Undergraduate students from year 1 to 5 form all the clusters, as those who are currently studying at the university were invited to participate on a voluntary basis.

Measurements

The questionnaire used for this study was a combination of items from the following:

PIU was assessed using the Young's Diagnostic Questionnaire (YDQ) (Young, 1998). The YDQ was developed based on the diagnostic criterion of pathological gambling listed in the DSM-4 (American Psychiatric Association, 1994). The YDQ comprised of 8 "yes" and "no" items assessing patterns of Internet usage in terms of preoccupation, tolerance, loss of control, withdrawal, negative consequences, denial, and escapism (scoring 0-8). One point was given to each "Yes" answer. Diagnosis of PIU was established when there is a score of $\geq$ 5. The Cronbach's Alpha value was 0.678.

Socio-demographic variables including age, gender, ethnicity, current year of study, self-perceived economic status and current residence (6 items). The item on self-perceived economic status had a response options from 1=wealthy (within the highest 25% in your country in terms of wealth), 2=Quite well-off (within the 50-75% range for your country), 3=Not very well off (within the 25-50% range for your country) and 4=Quite poor (within the lowest 25% in your country in terms of wealth).

Internet use variables were open ended items on number of hours spent on the Internet in a day, number of hours spent on the Internet for study purposes and recreational purposes in a day, number of hours spent on the Internet for pornography in a week and number of hours using smartphone in a day (5 items).

Psychosocial variables included items from the World Health Organization adverse childhood experience scale (CDC, 2016; WHO, 2016) to measure child abuse experiences in terms of emotional (5 items; Cronbach's Alpha (0.78)), physical (2 items; Cronbach's Alpha (0.74)) and sexual abuse (4 items; Cronbach's Alpha (0.81)).

Self-perceived life satisfaction was measured using one-item: "All things considered, how satisfied are you with your life as a whole?" adapted from Lucas & Donnellan (2012). The response options ranged from 1=very satisfied to 5=very dissatisfied.

Self-perceived academic performance was measured using one-item "How would you rate your academic performance" with response options from 1=excellent to 5=poor.

Co-morbid symptoms measured were: gambling, measured using the item "Have you felt that you might have a problem with gambling?" with response options from 0=never, 1=sometimes, 2=most of the time, 3=almost always; tobacco use measured using the item "Do you currently use one or more of the following tobacco products (cigarettes, snuff, chewing tobacco, cigars, etc.) with response options "yes" and "no" (World Health Organization, 1998); and drug use measured using the item "How often have you taken drugs in the past 12 months; other than prescribed by healthcare providers?" with response options

from 1= 0 times, 2=1-2 times, 3=3-9 times and 4 = ≥ 10 times. The Alcohol Use Disorder Identification Test (AUDIT-C, 3 items). was used to assess harmful alcohol use, with response options ranging from 0=never, 1=less than monthly, 2=monthly, 3=weekly and 4=daily or almost daily. A score greater than or equal to three was considered harmful for women and a score greater than or equal to four for was considered harmful for men (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998).

Depression was screened using the Centre for Epidemiological Studies Depression Scale (CES-D, 10 items) with a Likert-scale from 1=Rarely (<1day), 2=Some/little (1-2 days), 3= Much (3-4 days) and 4=Most (5-7 days). A score of more than 10 indicates moderate depression, ≥ 15 indicates severe depression (Andresen, Malmgren, Carter, & Patrick, 1994). The Cronbach's Alpha value was 0.71.

Post-traumatic stress disorder (PTSD) in the past month was screened using Breslau's 7-item screening scale. A score of ≥ four indicates positive for PTSD (Kimerling et al., 2006). The Cronbach's Alpha value was 0.81.

Data Collection Process

This study received ethics approval from the University of Malaya Medical Ethics Committee (ref: MECID.NO: 201412-905).

On data collection days, the enumerators were stationed at common student areas within the faculties, centers and academies where students were most likely to be found. Trained enumerators approached students and explained about the study purpose, anonymity, voluntariness and the consent of participation study. Written informed consent were obtained from them before paper questionnaire were given for self-administration. Data collection ceased when the number of samples required for both gender within each cluster were achieved.

Data Analysis

Descriptive analyses were performed to provide socio-demographic, psychosocial, Internet use patterns and co-morbid symptoms information for non-PIU and PIU and, addiction symptoms that were common among the respondents. Bivariate logistic regression was performed to determine the associations between the socio-demographic, Internet use, psychosocial and co-morbid symptoms variables with respondents with PIU. Factors, which were found to be significant, were then included in the model for multiple binary logistic regression using the 'Enter' method, and the factors associated with PIU were identified. The crude and adjusted odds ratios with its 95% confidence interval were reported, where applicable. Data analysis was conducted using Statistical Package for the Social Sciences Version 20 (IBM Corporation, 2015). Significance were determined by using $p<0.05$.

Results

A total of 1132 students were approached during data collection. However, only 1023 completed the questionnaire were included in the data analysis (response rate: 90.4%). The mean age of the respondents was 20.73 ± 1.49 years old (ranging from 18 to 28 years old). There was almost equal proportion of female (50.90%) and male (49.1%) respondents. More than half of the respondents were Malay (52.3%) followed by Chinese (40.0%), Indian (3.9%)

and Others (3.8%). Most respondents were in Year 1 (37.8%) and perceived themselves to be from family from low socio-economic status (58.8%).

Regarding Internet use, 28.9% were pathological users and among these, majority were Chinese (31.5%), 22 years old and above (31.0%), in Year 1 (31.5%) and perceived themselves to be from family from higher socio-economic status (32.5%).

Overall, the respondents' average hours of Internet use per day was 7.18 hours; an average of 3.09 ± 2.23 hours were used for study purpose (per day), 4.09 ± 3.30 hours for recreational purpose (per day) and 0.55 ± 2.39 hours for pornography purpose (per week). Among those who use Internet for pornography purpose, highest proportion was found among the pathological users (36.3%). Almost seventy percent (68.9%) of the respondents use Internet at least five hours per day whereas 72.2% student use smart phone at least four hours per day.

Among the pathological users, most of them had low self-perceived life satisfaction (33.2%) and self-perceived poor academic performance (34.5%). Gambling problem (45.4%), tobacco use (41.9%), drug use (44.9%), depression (46.2%) and PTSD symptoms (50.0%) were most commonly reported among pathological users compared to non-PIU (Table 1).

Table 1

Distribution of respondents by socio-demography, psychosocial, Internet use patterns and co-morbid symptoms and types of Internet users

Characteristics	Sample n (%)	Non-pathological Internet users n (%)	Pathological users n (%)
Socio-demographic			
All	1023	727 (71.1)	296 (28.9)
Gender			
Male	501 (49.1)	338 (67.4)	163 (32.6)
Female	519 (50.9)	387 (74.6)	132 (25.4)
Age, mean ± S.D. (years)	20.73 ± 1.49		
18-19	254 (24.8)	189 (74.4)	65 (25.6)
20-21	443 (43.3)	313 (70.6)	130 (29.4)
22 and above	326 (31.9)	225 (69.0)	101 (31.0)
Ethnicity			
Malay	535 (52.3)	386 (72.1)	149 (27.9)
Chinese	409 (40.0)	280 (68.5)	129 (31.5)
Indian	40 (3.9)	32 (80.0)	8 (20.0)
Others	39 (3.8)	29 (74.4)	10 (25.6)
Current year of study			
Year 1	387 (37.8)	265 (68.5)	122 (31.5)
Year 2	284 (27.8)	204 (71.9)	80 (28.1)
Year 3	154 (15.1)	113 (73.4)	41 (26.6)
Year 4	187 (18.3)	137 (73.3)	50 (26.7)
Year 5	11 (1.1)	8 (72.8)	3 (27.2)
Self-perceived family socio-economic status			
High	421 (41.2)	284 (67.5)	137 (32.5)
Low	602 (58.8)	443 (73.6)	159 (26.4)

Table 1 *(Continued)*

Characteristics	Sample n (%)	Non-pathological Internet users n (%)	Pathological users n (%)
Duration of Internet use variables	Mean ± SD		
Duration of Internet use (overall) (hours) (≥5 hours per day)	7.18 ± 4.37 705 (68.9)	482 (68.4)	223 (31.6)
Duration of Internet use for study purpose (hours) (≥3 hours per day)	3.09 ± 2.23 493 (48.2)	347 (70.4)	146 (29.6)
Duration of Internet use for recreational purpose (hours) (≥3 hours per day)	4.09 ± 3.30 610 (59.6)	417 (68.4)	193 (31.6)
Duration of Internet use for pornography purpose (hours) (past week)	0.55 ± 2.39 201 (19.6)	128 (63.7)	73 (36.3)
Duration of smart phone use (hours) (≥4 hours per day)	7.72 ± 5.64 739 (72.2)	503 (68.0)	236 (31.9)
Psychosocial factors			
Childhood emotional abuse	480 (46.9)	319 (66.5)	161 (33.5)
Childhood physical abuse	410 (40.1)	271 (66.1)	139 (33.9)
Childhood sexual abuse	127 (12.4)	83 (65.4)	44 (34.6)
Self-perceived life satisfaction			
Low	190 (18.6)	127 (66.8)	63 (33.2)
Medium	624 (61.0)	440 (70.5)	184 (29.5)
High	209 (20.4)	160 (76.6)	49 (23.4)
Self-perceived academic performance			
Poor	316 (30.9)	207 (65.5)	109 (34.5)
Satisfactory	549 (53.7)	405 (73.8)	144 (26.2)
Excellent	158 (15.4)	115 (72.8)	43 (27.2)
Skipping breakfast			
Never	516 (50.4)	383 (74.2)	133 (25.8)
Sometimes	402 (39.1)	271 (67.4)	131 (32.6)
Everyday	105 (10.3)	73 (69.5)	32 (30.5)
Comorbid symptoms			
Having gambling problem	55 (25.7)	30 (54.6)	25 (45.4)
Current tobacco use	31 (3.0)	18 (58.1)	13 (41.9)
Harmful alcohol use	20 (10.1)	12 (60.0)	8 (40.0)
Drug use (Past 12 months)	49 (4.8)	27 (55.1)	22 (44.9)
Depression (moderate/severe)	242 (23.7)	130 (53.8)	112 (46.2)
Sleeping problem (moderate/severe)	680 (66.5)	469 (69.0)	211 (31.0)
PSTD symptoms (4 or more)	112 (10.9)	56 (50.0)	56 (50.0)

In terms of various addiction symptoms, over half of the respondents were preoccupied with the Internet and/or smart phone (59.9%) followed by staying on-line longer than originally intended (57.1%), felt the need to use the Internet and/or smart phone with increasing amounts of time in order to achieve satisfaction (53.8%) and used the Internet and/or smart phone as a way of escaping from problems or of relieving a dysphoric mood (52.0%). Higher proportion of non-PIU stayed on-line longer than originally intended, felt the need to use the Internet and/or smart phone with increasing amounts of time in order to achieve satisfaction compared to PIU, repeatedly made unsuccessful efforts to control, cut back, or stop Internet and/or smart phone use, jeopardized or risked the loss of significant relationship, job, educational or career opportunity because of the Internet and/or smart phone and lied to family members, therapist, or others to conceal the extent of involvement with the Internet and/or smart phone as compared to PIU (Table 2).

Table 2

Distribution of respondents according to various Internet addiction symptoms

Items	All N (%)	Non-pathological Internet use N (%)	Pathological Internet use N (%)
Preoccupied with the Internet and/or smart phone (think about previous on-line activity or anticipate next on-line session)	613 (59.9)	433 (59.6)	180 (60.8)
Stay on-line longer than originally intended	585 (57.1)	420 (57.8)	165 (55.7)
Feel the need to use the Internet and/or smart phone with increasing amounts of time in order to achieve satisfaction	551 (53.8)	401 (55.2)	150 (50.7)
Use the Internet and/or smart phone as a way of escaping from problems or of relieving a dysphoric mood (e.g., feelings of helplessness, guilt, anxiety, depression)	532 (52.0)	374 (51.4)	158 (53.4)
Repeatedly made unsuccessful efforts to control, cut back, or stop Internet and/or smart phone use	449 (43.9)	330 (45.4)	119 (40.2)
Feel restless, moody, depressed, or irritable when attempting to cut down or stop Internet and/or smart phone use	325 (31.8)	229 (31.5)	96 (32.4)
Jeopardized or risked the loss of significant relationship, job, educational or career opportunity because of the Internet and/or smart phone	186 (18.1)	139 (19.1)	47 (15.9)
Lied to family members, therapist, or others to conceal the extent of involvement with the Internet and/or smart phone	146 (14.2)	104 (14.3)	42 (14.2)

Determinants of PIU

Simple logistic regression shows that gender, self-perceived family socio-economic status, overall Internet use (≥5 hours per day), Internet use for recreational purpose (≥3 hours per day), Internet use for pornography purpose (past week), smart phone use (≥4 hours per day), childhood emotional abuse, childhood physical abuse, self-perceived life satisfaction, self-perceived academic performance, skipping breakfast, having gambling problem, involvement in drug use (past 12 months), having depression (moderate/severe), sleeping

problem (moderate/severe) and PSTD symptoms (4 or more) were significantly associated with PIU.

After adjusting for the confounding factors, the factors significantly associated with PIU were Internet use for recreational purpose (≥3 hours per day) (AOR: 3.89; 95% CI: 1.33 – 11.36 and p<0.05), Internet use for pornography purpose (past week) (AOR: 2.52; 95% CI: 1.07 – 5.93 and p<0.05)), having gambling problem (AOR: 3.65; 95% CI: 1.64 – 8.12 and p<0.01), involvement in drug use (past 12 months), (AOR: 6.81; 95% CI: 1.42 – 32.77 and p<0.05) and having depression (moderate/severe) (AOR: 4.32; 95% CI: 1.83 – 10.22 and p<0.01) (Table 3).

Table 3

Logistic regressions on the determinants of PIU

Characteristics	Unadjusted Odds Ratio (95% confidence interval)	Adjusted Odds Ratio (95% confidence interval)
Socio-demographic factors		
Gender		
Female	1 (Reference)	1 (Reference)
Male	1.41 (1.07 – 1.85)*	0.39 (0.15 – 1.01)
Age in Year		
18-19	1 (Reference)	---
20-21	1.21 (0.88 – 1.71)	---
22 and above	1.29 (0.89 – 1.87)	---
Ethnicity		
Malay	1.11 (0.53 - 2.35)	---
Chinese	1.33 (0.63 - 2.82)	---
Indian	0.72 (0.25 - 2.08)	---
Others	1 (Reference)	---
Current year of study		
Year 1	1.22 (0.32 - 4.70)	---
Year 2	1.04 (0.27 - 4.04)	---
Year 3	0.96 (0.24 – 3.82)	---
Year 4	0.93 (0.24 – 3.81)	---
Year 5	1 (Reference)	---
Self-perceived family socio-economic status		
Low	1 (Reference)	1 (Reference)
High	0.75 (0.57 – 0.98)*	0.61 (0.27 – 1.33)
Internet use factors		
Overall Internet Use (≥5 hours per day)	1.54 (1.13 – 2.09)*	0.44 (0.15 – 1.26)
Study purpose (≥3 hours per day)	1.05 (0.80 – 1.38)	---
Recreational purpose (≥3 hours per day)	1.38 (1.04 – 1.83)*	3.89 (1.33 – 11.36)*
Pornography purpose (past week)	1.54 (1.11 – 2.14)*	2.52 (1.07 – 5.92)*
Smart phone use (≥4 hours per day)	1.74 (1.25 – 2.40)*	1.030 (0.448 – 2.367)
Psychosocial factors		
Childhood emotional abuse	1.53 (1.17 – 2.01)*	0.85 (0.29 – 2.48)
Childhood physical abuse	1.50 (1.14 – 1.97)*	2.26 (0.79 – 6.43)
Childhood sexual abuse	1.37 (0.92 – 2.03)	

Table 3 *(Continued)*

Characteristics	Unadjusted Odds Ratio (95% confidence interval)	Adjusted Odds Ratio (95% confidence interval)
Self-perceived life satisfaction		
Low	1 (Reference)	1 (Reference)
Medium	0.83 (0.59 – 1.18)	1.55 (0.59 – 4.12)
High	0.60 (0.36 – 0.93)*	2.21 (0.58 – 8.31)
Self-perceived academic performance		
Poor	1 (Reference)	1 (Reference)
Satisfactory	0.67 (0.50 – 0.91)*	0.63 (0.27 – 1.48)
Excellent	0.69 (0.54 – 1.05)	2.17 (0.80 – 5.85)
Skipping breakfast	1.36 (1.03 – 1.79)*	1.77 (0.82 – 3.82)
Comorbid symptom factors		
Having gambling problem	3.30 (1.71 – 6.38)**	3.64 (1.63 – 8.12)*
Current tobacco use	1.81 (0.87 – 3.74)	---
Harmful alcohol use	1.96 (0.75 – 5.08)	---
Drug use (Past 12 months)	2.08 (1.16 – 3.72)*	6.81 (1.41 – 32.77)*
Depression (moderate/severe)	2.78 (2.05 – 3.77)*	4.31 (1.82 – 10.21)*
Sleeping problem (moderate/severe)	1.36 (1.01 – 1.83)*	0.99 (0.42 – 2.36)
PTSD symptoms (4 or more)	2.91 (1.94 – 4.35)**	0.54 (0.15 – 1.90)

Note: PSTD= Posttraumatic stress disorder; **$p<0.001$; *$p<0.05$
Multiple logistic regression, 'Enter' method was applied; Multicollinearity were checked and not found; Hosmer-Lemeshow test, (p=0.725); Pearson chi-square and Significant for Model (p< 0.001) and Classification table (overall correctly classified percentage=79) were applied to check the model fitness

Discussion

Prevalence of PIU

The prevalence of PIU found in this study was 28.9%, using the 8-items YDQ. In another Malaysian study, which also used the YDQ, a higher prevalence was reported (43%). However, the sample size of the study was only 162 (Ng, Isa, Hashim, Pillai, & Harbajan Singh, 2015). Compared to studies in other Asian nations, the prevalence rate of PIU among 1262 undergraduates from Hong Kong was lower at 15.7%; determined using the Chen's Internet Addiction Scale (CIAS) (Kim, Griffiths, Lau, Fong, & Lam, 2013). Similarly, in a nationally representative sample of 3616 college students in Taiwan, the prevalence of IA was found to be 15.3% using the revised version of the CIAS (Lin, Ko, & Wu, 2011). A lower prevalence of IA at 9.7% was also found among 1123 Turkish college students using the Turkish version of the 36-items Internet Addition Scale (IAS) (Canan, Ataoglu, Ozcetin, & Icmeli, 2012). However, Jordanian undergraduates students reported a higher prevalence of 40% (n=235/587); determined using the 20-items from Young's Internet Addiction Test (IAT) (Alzayyat, Al-Gamal, & Ahmad, 2015). The variation in the prevalence of IA was attributed to the different assessment tools, classification criteria used and sample sizes. Currently, only Internet gaming disorder was listed in the Appendix of the Diagnostic and Statistical Manual for Mental Disorders (DSM) version 5, which calls for further empirical and clinical research for the condition. There is no gold standard for assessment of Internet

addition. There is a need for a standardized instrument and cut-off point so that prevalence of PIU can be compared across countries and the actual extent of the problem with IA in the world can be presented in order for IA to be recognized, justified and eventually designated as a mental disorder such as in the DSM or International Classification of Diseases (ICD).

Studies in UK and US reported a much lower prevalence of IA among university and college students at 3.2% (Kuss et al., 2013) and 6.0% (Yates, Gregor, & Haviland, 2012), using the Assessment for Computer and Internet Addiction –Screener (AICA-S) and IAT respectively. There was a higher level of PIU among Asian students compared to non-Asian students (Yates et al., 2012; Zhang, Amos, & McDowell, 2008). Developed countries such as the US and the UK have had earlier Internet exposure and the users may have adjusted to Internet use, compared to some developing countries in Asia, which are still coping with the advantages and disadvantages of Internet use (Zhang, Amos, & McDowell, 2008). Other reasons cited were due to competitive academic environment among students in Asian countries, which resulted in dependence on the Internet as a way of coping with academic stress, and sociocultural difference whereby online gaming is highly popular and is the most developed in many Asian countries (Yen, Yen, & Ko, 2010).

Internet use Patterns

The Internet use pattern determinants for PIU among the respondents were using Internet for recreational purpose and pornography purpose. Most of the students use the Internet for recreational purpose up to 4 hours per day as compared to using it for academic purpose. Italian undergraduates reported spending an average of 10 hour online per week for recreational use (Casale & Fioravanti, 2011). Our study respondents are similar to Jordanian university students whereby they use Internet mainly for recreational purpose; chatting (little time for academic purpose) and they preferred to access to the Internet using their mobile phone (Alzayyat et al., 2015). A qualitative study conducted among eight university students in Malaysia revealed that they used the Internet for social networking, chatting, downloading, viewing or listening to movies/music and searching for information and most of them access the Internet using laptop/computer (Yeap, Ramayah, Kurnia, Abdul Halim, & Ahmad, 2015).

The use of Internet for recreational purposes among university students is not surprising. Among Hong Kong university students, it was identified that dissatisfaction with university's life and, using the Internet for recreational purposes and interactive activities such as gaming, gambling, downloading music and videos were risk factors for PIU (Kim et al., 2013). Our study also reported that more than half of the respondents used the Internet and/or smart phone as a way of escaping from problems or for relieving a dysphoric mood and this further supports the reason for using Internet for recreational purpose among the university students. Moreover, more than half of study respondents felt that they need to use the Internet and/or smart phone with increasing amounts of time in order to achieve satisfaction. This indicates that the university students would spend more time on recreational purpose and not for academic purpose. In the study by Kim, et al (2013), only 14.8% of students with PIU felt that their IA problem was very problematic and only 46.2% reported that they are interested in learning skills to control their Internet use (Kim et al., 2013). This warrant university authority to pro-active screen students with IA problems and develop interventions to address this issue. Among the strategies that perhaps can be adopted are creating awareness on the adverse health outcomes resulting from IA in the university environment, promotion of healthy and active lifestyle through health awareness campaigns, talks, poster and pamphlet and controlling students access to recreational websites. University authorities could also

incorporate more online learning courses in the undergraduate curriculum so students will spend more time on the Internet for educational purpose. As our findings also indicate that there is a higher proportion of non-PIU who reported various Internet addiction symptoms (Table 2), this indicates that interventions to address PIU should also target students which shows early signs of IA and not only those with PIU to prevent development to PIU.

Another factor influencing PIU identified in our study was using the Internet for pornography. Most of the undergraduate students are at the age of between 20 to 24 years old and curiosity are normal among young people such as on topics regarding sex. In Malaysia, while sexual education is being taught in schools, however, it is not being taught as a standalone subject but incorporated into other subject such as physical education, Moral and Islamic studies, science, and biology and with strong emphasis on abstinence. Not only that, teachers were also reported to have poor teaching skills and all these factors led to students felt that they are not getting comprehensive information about sex (Johari, Maharam, & Zulkifli, 2012). Hence it is not surprising that students are getting information from the Internet. Furthermore, sex is also rarely discussed openly in the Malaysian culture. Another study among Indonesian university students found that Internet was the main source for pornography and pornography consumption was found to significantly predict common sexual behaviours in non-marital relations (Hald & Mulya, 2013). Searching for sexual content has been significantly predicted could lead to development of compulsive Internet use among adults (Meerkerk, Van Den Eijnden, & Garretsen, 2006). Education authorities should move to a more open and well-informed sex education in schools so that students would not have to rely on the Internet for sexual information which may potentially lead to them to developing PIU.

Co-morbid Symptoms

Even though the frequency of having a gambling problem among university students with PIU in our study was small (n=55), it was a significant risk factor for PIU. University students whom most living away from parental supervision undergo economic changes strive to earn more money albeit illegally such as through gambling. Furthermore, university students are more well verse with ICT and the anonymity, accessibility, and 24-hour availability of Internet enables online gambling much easier. In addition, with online gambling, the enforcement of the legal age for gambling ($\geq$ 21 years in Malaysia) is more difficult. All these factors may contribute to online gambling and subsequently leading to PIU. One way university authority could address the issue of gambling problem that could lead to PIU is to block access to online gambling sites such as mahjong, poker, and soccer betting that are common among university students (Wu, Lai, & Tong, 2015).

Frequency of drug use among university students with PIU in our study was small (n=49) but was also a significant factor for PIU. The similarities between drug use and IA is in regards to dependence symptoms such as tolerance levels and withdrawal (Anderson, 2001; Young, 1998). There appeared to be common personality characteristics in students with IA and students with substance abuse such as high novelty seeking, high harm avoidance, and low reward dependence (Ko et al., 2006) as well as psychoticism (Fisoun, Floros, Siomos, Geroukalis, & Navridis, 2012), which increase their vulnerabilities to any addiction. Thus, it is not surprising that persons with PIU may also be engaged in other addiction-related behaviors such as drug use (Fisoun et al., 2012; Sung, Lee, Noh, Park, & Ahn, 2013).

The link between depression and PIU among university students is well established. Our study showed that students who are depressed are 4.3 times more at risk of having PIU. Anand et al., (2018) in their study also found that students experiencing psychological

distress, namely depression (OR=1.175; P<0.001) were at higher risk for engaging in IA. Their study also showed a positive correlation between psychological distress (depression) and IA (r=0.363, P<0.001). The findings are further supported by another study carried out among Indian adolescents where those with excessive use Internet had high scores on anxiety, depression (Goel, Subramanyam, & Kamath, 2013). Elsewhere, problematic Internet users also suffered from poorer psychological health (depression, anxiety and stress) (Wong, Yuen, & Li, 2015). Students who are depressed are more likely to have PIU and the reason could be the use of the Internet to help them to cope with their depression leading to excessive use (Alzayyat et al., 2015; Orsal, Orsal, Unsal, & Ozalp, 2013; Yang, Sato, Yamawaki, & Miyata, 2013). IA have also been found to lead to depression (Dong, Lu, Zhou, & Zhao, 2011; Lam & Peng, 2010). The dual presence and interactions of depression and IA may further aggravate both the clinical situations (Facer, Sutherland, Furlong, & Furlong, 2001; Tsai & Lin, 2003; Wang, 2001). Depression among university students is not uncommon and is a major problem (Ibrahim, Kelly, Adams, & Glazebrook, 2013; Lei, Xiao, Liu, & Li, 2016). There is a need for university authority to screen and to provide psychosocial support for students with depressive symptoms or depression and this may also help to prevent PIU.

The findings of this study implied that university authorities need to be aware of the prevalence so that interventions can be developed to prevent adverse outcomes of PIU. Interventions should focus on screening students for PIU, creating awareness on the negative effects of PIU and promoting healthy and active lifestyle and, restricting students' access to harmful websites.

Limitations of Study

This study used self-reported information, hence the data may be subjected to reporting errors, recall bias and social desirable responses. The measure developed to assess PIU was based on YDQ which was designed for gambling. The measure has not been tested outside this study. The PIU measure also did not account for specific uses of the internet, instead assessing internet use in general. The causality or directions of the relationships between the identified factors influencing PIU cannot be ascertained due to the cross-sectional study design. As the respondents of this study were obtained from only one public university, thus, one has to be cautious of the generalizability of the findings, as it may not be representative of the overall university students in Malaysia.

Conclusion

There is a high prevalence rate of PIU (28.9%) among university students in Malaysia, and the factors significantly associated with PIU were Internet use for three or more hours for recreational purpose, Internet use for pornography purpose, having gambling problem, involvement in drug use in the past 12 months and having moderate/severe depression. Those students with these associated factors were at higher risks of having PIU.

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Conflict of Interest

The authors declare there are no conflict of interest.

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