



Generalized problematic Internet use, depression, and explicit self-esteem: Evidence from the United Arab Emirates

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ABSTRACT

Background: This study estimated the prevalence of generalized problematic Internet use (PIU) in a sample of college-aged young adults resident in the United Arab Emirates. It also assessed associations between PIU, Internet use, and two psychological outcomes, depression and explicit self-esteem.

Methodology: The study was cross-sectional. A sample of 706 participants ($M = 20.71$, $SD = 2.13$) completed measures of generalized PIU, depression, explicit self-esteem, and a range of demographic variables.

Results: PIU was common in this sample, so too was depression, and low self-esteem. PIU did not differ as a result of age, sex, level of education, or marital status. PIU and its factors were consistently predicted by elevated depressive symptoms, increasing duration of daily online time, and diminished ratings of self-esteem.

Conclusion: This study serves as the very first estimation of generalized PIU in a sample of young adults resident in this region of the world.

1. Introduction

Access to the Internet has increased, exponentially, over the last decade and it is now used for a great myriad of purposes in the academic, business, and social spheres. While access in Africa remains relatively low in comparison to other parts of the world, some regions have witnessed dramatic growth. The International Telecommunication Union's (ITU) most recent ICT Indicators Report (2017) indicates that, in the United Arab Emirates (UAE) much of the population now have access to the Internet, a total of 94.8% of the population. This represents a substantial increase of more than 30% over the previous decade (ITU World Telecommunication/ICT Indicators Database, 2017).

It is now recognized that Internet use may occur on a spectrum from 'adaptive' to 'maladaptive' (Billieux et al., 2017). There is growing concern that, for those who engage in excessive and unhealthy use of the Internet, a phenomenon that has come to be referred to as problematic Internet use (PIU, also known as Internet addiction), a number of deleterious consequences may follow. PIU may manifest as any of the following types of disordered behaviors: excessive social network use, gambling, viewing pornography, unrestrained online shopping, or inordinate video gaming (Ioannidis et al., 2016). It has been demonstrated that these behaviors are associated with marked functional impairment which manifests as a loss of productivity at work, or impairment in scholastic performance in the case of children and

adolescents (Derbyshire et al., 2013; Ho et al., 2014). Moreover, a substantial body of literature has demonstrated associations between PIU and a range of poor mental health outcomes such as depression, anxiety, burnout, insomnia, a reduction in life satisfaction, well-being, quality of life, empathy, diminished impulsivity, and lowered self-esteem and self-control (Evren, Evren, Dalbudak, Topcu, & Kutlu, 2019; Lachmann, Sariyska, Kannen, Cooper, & Montag, 2016, 2018; Mei, Yau, Chai, Guo, & Potenza, 2016; Peterka-Bonetta, Sindermann, Sha, Zhou, & Montag, 2019; Yücesen & Üzer, 2018). It is important to bear in mind though that, at present, controversy exists regarding the specific nomenclature and terminology used to refer to excessive and problematic use of the Internet. This is in addition to a parallel debate as to whether Internet-related behaviors should at all be examined within an addiction framework (Petry & O'Brien, 2013). The term 'Internet addiction' is often discussed controversially but appears to be used frequently (Kuss, Griffiths, Karila, & Billieux, 2014), while others have preferred to employ the term 'Internet-use disorders' (Brand, Young, Laier, Wölfling, & Potenza, 2016). An additional consideration in relation to the nomenclature of the construct follows from empirical evidence that appears to suggest that differentiating between generalized PIU and the problematic use of specific Internet-related behaviors is wise. Research that has assessed the specific behaviors that individuals engage in online suggests that individuals do not become addicted to the medium itself but rather to the specific behaviors engaged in or the content accessed (Starcevic, 2013; Brand et al., 2016).

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Internet Gaming Disorder, one type of Internet-facilitated activity, has been acknowledged as a phenomenon requiring further study (American Psychiatric Association, 2013). Gaming Disorder is also now included in the most recent version of the International Classification of Diseases manual released to member states (World Health Organization, 2018). While this can be regarded as a progression in understanding the psychopathology of Internet-related activities, PIU is a multifaceted problem that exceeds the remit of online gaming. There is an accumulating body of evidence which shows that a range of online behaviors can impair individuals' functioning following compulsive and excessive engagement; such as, online gambling (Griffiths, 2003), online shopping (Claes, Müller, & Luyckx, 2016), viewing pornography (Lai, Pawlikowski, Pekal, Schulte, & Brand, 2013), email and instant messaging (Igarashi, Motoyoshi, Takai, & Yoshida, 2008), and social media use (Kuss, Griffiths, & Binder, 2013).

The PIU phenomenon has been observed to occur in a number of diverse cultures and contexts but the majority of studies reporting prevalence of PIU have been limited to European and Far East Asian samples. Additionally, point prevalence estimates of PIU tend to vary widely in the literature, from 1% to 36.7% (Ioannidis et al., 2018). This wide variability is most likely reflective of the variety of operational definitions adopted and the varying assessment measures employed by researchers. However, the totality of prevalence studies, to date, reports that PIU is exhibited by approximately 1% to 18% of European samples (Achab et al., 2014; Petersen, Weymann, Schelb, Thiel, & Thomasius, 2009; Spada, 2014; Weinstein, Feder, Rosenberg, & Dannon, 2014). Moreover, a number of cross-cultural studies conducted with relatively large samples of both adults and adolescents have found rates of problematic users in these samples to range from 1% to 5% (2014, 2016, Blinka et al., 2015; Durkee et al., 2012; Sariyska et al., 2014; Tsitsika et al., 2012). It does however appear that prevalence of PIU among Far East Asian samples tend to be higher compared to their European counterparts. A total of 17.9% of Taiwanese university students in Tsai et al. (2009), 20.3% of Ha et al. (2007) sample of adolescents in Korea, and 22.2% of the adolescents sampled in Mei et al. (2016) reported behaviors indicative of PIU.

Age and gender appear to be important correlates of PIU with clear patterns relating to particular behaviors. Adolescents and young adults are considered to be the most vulnerable as they are the most prolific users of the Internet (Kuss & Lopez-Fernandez, 2016). Younger age is typically associated with problems related to gaming, media streaming, and problematic online shopping (Andreassen, Torsheim, Brunborg, & Pallesen, 2012; Mueller et al., 2010; Trotzke, Starcke, Müller, & Brand, 2015). Males are approximately five times more likely to exhibit PIU compared to females, but females can present with PIU as well (Mei et al., 2016). Kuss and Lopez-Fernandez (2016) have suggested that female participants may currently be understudied as a number of studies have included male-only samples. There is some evidence to suggest that males and females differ with regard to the kinds of online activities they elect to engage in and, as a result, the negative consequences that are likely to ensue (Ioannidis et al., 2018).

Furthermore, recent literature suggests that PIU behaviors are strongly associated with existing identifiable mental health concerns, most notably depression and low self-esteem, and these appear to present equally between men and women (El Asam, Samara, & Terry, 2019; Romer, Bagdasarov, & More, 2013; Widianto & Griffiths, 2011; Yellowlees & Marks, 2005). The direction of this relationship however remains unclear. Some have argued that PIU is a consequence of the psychopathology (e.g., Gámez-Guadix, 2014; Park, Hong, Park, Ha, & Yoo, 2013), while others contend that PIU also precedes the onset of these difficulties (e.g., de Vries, Nakamae, Fukui, Denys, & Narumoto, 2018; Kuss et al., 2014). Others still have proposed that PIU may serve as a coping mechanism for those struggling with depression and low self-esteem, particularly as it may facilitate connections with others via social media or instant messaging for individuals who would otherwise experience social isolation and disconnection (Dillman-Carpentier

et al., 2008; Griffiths, 2012; Horwitz, Hill, & King, 2011).

Brand et al. (2016) have proposed a comprehensive model that attempts to summarize the mechanisms that they believe underlie the development and maintenance of specific Internet-related disorders. It is the first process model to attempt to capture the temporal dynamics of the addiction process. Specifically, the Interaction of Person-Affect-Cognition-Execution model distinguishes between predisposing factors and a number of mediating and moderating factors. It proposes that coping styles and Internet-related cognitive biases moderate the relationship between predisposing factors (i.e. genetic and other biological determinants, psychopathological and personality factors) and the development of Internet-use disorders. Moreover, affective and cognitive responses to environmental stimuli such as cue-reactivities and cravings and attentional biases are proposed to be mediator variables. They, in turn, diminish inhibitory control and executive functioning, which Brand et al. (2016) contend, contribute to the individual's tendency to engage in excessive Internet use. While this model is an especially relevant framework for studies of PIU, its proposed mechanisms have not yet been subjected to substantial empirical investigation.

1.1. Aims of the present study

As a contribution to the literature, the current study sought to investigate the prevalence of PIU in a sample of individuals resident in the UAE. This is highly pertinent given that there have been no investigations of this nature in this region of the world. The study specifically sampled participants in the young adult age range, as this is predominantly the age range focused on in existing studies and would enable comparison with the existing literature. Both males and females were included as studies that have included both genders are lacking, and, this would enable a comparison of PIU between the genders. The study also examined the association of PIU with depression, explicit self-esteem, and a range of demographic variables that included a measure of daily time spent using the Internet.

1.2. Hypotheses

The following hypotheses were proposed:

- The prevalence of PIU will be marginally higher in this sample than previously reported in the literature.
- PIU scores will significantly differ as a function of age, gender, relationship status, and level of education.
- Overall PIU scores, and each of its three factors, will be significantly predicted by daily time spent online, subjective perception of problematic use, and both depressive symptoms and low self-esteem.
- PIU in the clinical range (scores above the cut-off score of 22), and similarly the clinical range for each of its three factors (above the 80th percentile), will be significantly predicted by daily time spent online, subjective perception of problematic use, and both depressive symptoms and low self-esteem.

2. Methodology

2.1. Procedure

This study employed a cross-sectional, correlational design in which college students enrolled at a university in the UAE completed an online-administered battery of questionnaires. The sample was recruited using a convenience sampling strategy from a range of undergraduate and postgraduate psychology courses. Participants within this sampling frame were emailed an invitation link and were able to complete the brief survey (15 min completion time) in their own time via Qualtrics. Participants received one additional course credit for participation. Those who elected not to participate were not penalized. To ensure that

students did not feel coerced to participate, those who elected not to do so were provided with alternate opportunities from which equivalent credit could also be earned. The survey was administered in English. While Arabic is the official language of the UAE, all participants in the sampling frame were competent in English. All classes at the university at which the present study was conducted are taught in English. Students are required to possess a substantially high level of proficiency in English to gain admission demonstrated by scores on standardized English tests.

The study received ethical approval from the social sciences research ethics committee at the author's institution. The following mechanisms were put in place in the unlikely event that any negative consequences ensued following participation in the study. First, the survey commenced with a participant information sheet outlining the rights of the participants and the responsibilities of the researchers. The researcher's contact details were provided, and participants invited to make contact in the event that questions or concerns arose before or following completion of the survey. At the end of the survey, a debriefing statement reiterated the availability of the research team and the on-campus counseling service, either of whom could be contacted if participation evoked any concerning thoughts or feelings.

2.2. Participants

GPower was used to conduct a statistical power analysis. With a specified alpha level of .05 and power set at .8, the projected minimum sample size needed to detect a medium effect size ($f^2 = .15$) was 114. The final recruited sample was well above this threshold and consisted of a total of 706 participants who provided consent to participate. Participants ranged in age from 18 to 33 years ($M = 20.71$, $SD = 2.13$). All participants were Emirati citizens and of Arab descent. The sample was stratified into two sub-groups, a young adult group (18–22 years, $n = 276$) and an older group (23–33 years, $n = 74$) to determine whether any differences between age groups might emerge as the literature has often found excessive engagement with the Internet to be especially pronounced for those in the young adult age range (i.e. 18 to 22 years). The sample was predominantly female ($n = 534$, 75.6%), unmarried ($n = 650$, 92.1%), and were undergraduate students ($n = 574$, 81.3%). Participants self-reported the number of hours per day of online use. This varied from a minimum of 1 h per day to a complete 24 h, but the majority were grouped around the 3 to 10 h per day range ($M = 7.57$, $SD = 4.15$). Participants were also asked a subjective, closed-ended question ("Do you feel that you engage in excessive use of the Internet?") to which the majority responded 'no' ($n = 622$, 88.1%). Table 1 depicts frequencies for these demographic variables stratified by age-related subgroups.

2.3. Assessment measures

2.3.1. Demographic information

The following demographic information were collected: age, sex, number of years of education completed, current relationship status, the number of hours per day that they used the Internet, and a subjective question about their view as to whether they engaged in excessive, problematic Internet use.

2.3.2. Problematic Internet use

Problematic Internet use was measured using a recently developed, abbreviated, 6-item iteration of the Problematic Internet Use Questionnaire (PIUQ; Demetrovics et al., 2016). The original 18-item scale was developed using a Hungarian sample and thereafter shown to possess good psychometric properties using a range of different samples across a number of countries (Demetrovics, Szeredi, & Rózsa, 2008; Koronczai et al., 2011; Mazhari, 2012a, 2012b). The PIUQ assesses three dimensions of problematic Internet use: obsession, neglect, and control. The obsession subscale includes items that measure obsessive

Table 1

Descriptive data for the demographic characteristics and primary outcome variables.

Variables	Total sample (n = 706)	Males (n = 172)	Females (n = 534)
Age	20.71 (2.13)	20.13 (1.90)	20.89 (2.17)
Level of Education			
Undergraduate	574 (81.3)	158 (27.5)	416 (72.5)
Postgraduate	132 (18.7)	14 (10.6)	118 (89.4)
Marital status			
Single	650 (92)	168 (25.8)	482 (74.2)
Married	56 (8)	4 (7)	52 (93)
Daily internet use (hours)	7.57 (4.15)	6.52 (3.84)	7.91 (4.19)
Subjective question - excessive use?			
Yes	84 (11.9)	18 (21.4)	66 (78.6)
No	622 (88.1)	154 (24.8)	468 (75.2)
PIUQ (range: 6 – 30)	17.46 (5.52)	17.34 (5.81)	17.51 (5.84)
PIUQ Obsession	5.73 (2.38)	5.78 (2.52)	5.71 (2.33)
PIUQ Neglect	6.15 (2.03)	6.15 (2.05)	6.14 (2.03)
PIUQ Control	5.59 (2.16)	5.41 (2.26)	5.65 (2.12)
CESD-10 (range: 0 – 30)	12.38 (4.23)	11.17 (3.91)	12.76 (2.46)
RSES (range: 0 – 30)	19.28 (4.56)	19.10 (4.46)	19.34 (4.60)

Note. Data are frequency (%) for categorical variables and Mean (SD) for continuous variables. PIUQ = Problematic Internet Use Questionnaire; CESD-10 = Centre for Epidemiological Studies Depression Scale; RSES = Rosenberg Self-esteem Scale.

thinking about the Internet including daydreams and fantasies as well as the cognitive and affective results of abstaining from desired Internet use (i.e. withdrawal symptoms). The neglect subscale captures the respondent's experience of neglecting essential needs and everyday activities as a result of excessive Internet use. Finally, the control subscale contains items that assess the extent to which the respondent has attempted to control their excessive Internet use and their perceived success in doing so. Participants use a 5-point Likert scale from 1 ("never") to 5 ("always/almost always") to determine the degree to which each item relates to their experience. Example items include: "How often do you spend time online when you'd rather sleep?" and "How often do you feel tense, irritated, or stressed if you cannot use the Internet for as long as you want to?". Possible scores range from 6 to a maximum of 30, with higher scores being reflective of higher levels of problematic Internet use. Internal consistency in the present study was satisfactory (Cronbach's $\alpha = .81$).

2.3.3. Depression

The 10-item version of The Centre for Epidemiological Studies Depression Scale (CESD-10) is a Likert scale questionnaire that assesses depressive symptoms during the previous seven days (Andresen, Malmgren, Carter, & Patrick, 1994). It includes items that assess depressed affect, somatic symptoms, and positive affect. Items are scored from 0 ("rarely or none of the time") to 3 ("all of the time") and total scores can range from 0 to 30 with higher scores being indicative of greater severity of depressive risk. Andresen et al. (1994) identified the optimal score to identify individuals at risk of depression as a cut-off score of 10. The CESD-10 is frequently reported to be internally consistent with high Cronbach's alpha values ranging from .84 to .88, and this includes examinations with Arab samples (Ghubash, Daradkeh, Al Naseri, Al Boushi, & Al Daheri, 2000; Kazarian & Taher, 2010). Internal consistency for the present sample was satisfactory (Cronbach's $\alpha = .71$).

2.3.4. Self-esteem

The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1989) consists of 10 items that are rated on a Likert scale from 0 ("totally disagree") to 3 ("totally agree"). Scores can range from 0 to a maximum of 30 with higher scores being reflective more positive self-esteem. Rosenberg (1989) provided the following guidelines for interpreting the scale's

output: self-esteem is considered low when the overall score is less than 15, scores between 15 and 25 are within the normal range, and scores from 25 to 30 can be considered indicative of high self esteem. Internal consistency across a number of studies has been uniformly good, including among Arab populations (Abdel-Khalek, Korayem, & El-Nayal, 2012). Cronbach’s alpha values have tended to range from .74 to .88 (Boduszek, Hyland, Dhingra, & Mallett, 2013; Martín-Albo, Núñez, Navarro, & Grijalvo, 2007). Internal consistency in the present study was similarly high (Cronbach’s $\alpha = .81$).

2.4. Data analytic strategy

The dataset was first inspected for missing values. All missing data were imputed using the mean replacement method (less than 10% of the overall dataset required imputation). The data were then checked for normality by computing z-scores for skewness and kurtosis and by inspecting histograms of each variable’s distribution. The z-scores for skewness and kurtosis for all variables were larger than 1.96, which corresponds to an alpha level of .05; thus, the distributions were deemed to satisfy normality and parametric tests were then used in all analyses. The prevalence of all variables is reported using either means and standard deviations for continuous variables or counts and percentages for categorical variables. In determining the prevalence of scores at various levels of the variables, the recommended cut-off scores were used where these were available. Where no clear recommendations were made, the practice of prior researchers were used (e.g. El Asam et al.’s recommendation was used to delineate between the PIUQ subscales in the clinical and non-clinical ranges). Zero-order associations between all variables are reported using Pearson’s correlations (*r*). Two broad sets of hierarchical regression analyses were conducted to determine which demographic, Internet use, or psychopathological factors predicted PIU and each of its three factors in this sample. The first set of regressions (linear) used the overall PIU and factor scores (measured as continuous variables) as the dependent variables. For the second set of regressions (logistic), the dependent variables were dichotomized, and the same set of predictor variables used to determine which predicted PIU scores in the clinical range.

3. Results

3.1. Prevalence of problematic Internet use

PIU was common this sample ($M = 17.46, SD = 5.52$). When PIUQ scores were stratified using Demetrovics et al. (2016) recommended cut-off score of 15, more than half of the sample, a total of 412 participants fell above the cut-off, indicating that approximately 58% of this sample were at risk for PIU. The possible presence of age-related differences was then investigated. When the sample was subdivided into two age groups, a young adult group that included those participants aged 18–22 years ($n = 555, 78.6%$) and those aged between 23 and 33 years ($n = 151, 21.4%$), PIUQ mean scores did not significantly differ,

($t(704) = 1.25, p > .05$) nor were there differences between males and females ($t(704) = 0.54, p > .05$). When the PIUQ’s three factors were examined, none significantly differed according to age or sex (all $p > .05$). Table 1 contains a depiction of the means and standard deviations for this variable.

3.2. Prevalence of depression and low self-esteem

Depressive symptoms were highly prevalent in the sample ($M = 12.99, SD = 4.66$). On the CESD-10, using Andresen et al. (1994) recommendation of a cut-off score of 10, a total of 486 participants were deemed to be at risk for depression (68.8%). Symptoms of depression were more common among females compared to males, $t(704) = -4.34, p < .001$. When the two age-defined subgroups were compared, no statistically significant differences were evident on the CESD-10.

On the RSES, the overall sample produced a mean score in the normal range for self-esteem ($M = 19.28, SD = 4.56$). A total of 16.9% ($n = 119$) produced overall scores less than 15 indicative of low self-esteem and 9.6% ($n = 68$) scored in the high self-esteem category, while the majority (73.5%, $n = 519$) produced scores in the normal range. There were no differences on the RSES between males and females and between those in the younger and older groups.

Table 1 contains a depiction of the means and standard deviations for these variables.

3.3. Zero-order correlations between all variables

Computation of zero-order correlations between the primary variable (PIUQ), the two additional psychopathological variables (CESD-10 and RSES), and the demographic variables revealed a number of significant associations.

The primary variable, PIU, was significantly and positively correlated with the following variables: type of device used to connect to the Internet ($r = .09, p < .05$); the number of daily hours spent online ($r = .24, p < .001$); the subjective perception of excessive Internet use ($r = .29, p < .05$); and the presence of depressive symptomology ($r = .39, p < .001$). PIU was negatively correlated with self-esteem ($r = -.20, p < .001$). The other demographic variables were not correlated with PIUQ scores. The significant associations between the psychopathological variables (depression and low self-esteem) and problematic use scores provide evidence of the PIUQ’s concurrent validity. Most correlations were weak to moderate in magnitude with the strongest associations being between PIU and depressive symptoms (positively) and between self-esteem and depressive symptoms (negatively). All means, standard deviations and zero-order correlations between these demographic and outcome variables are illustrated in Table 2.

Table 2
Correlational matrix for all demographic and outcome variables for the complete sample ($n = 706$).

Variable	1	2	3	4	5	6	7	8	9	M (SD)	Range
1. Gender	1										
2. Age	.15**	1									
3. Level of education	.29**	.74**	1								
4. Relationship status	.12*	.26**	.24**	1							
5. Daily use (hours)	.14**	-.00	.03	-.01	1						
6. Subjective opinion of PIU	.01	.11**	.13**	-.04	.09*	1					
7. PIUQ	.05	-.05	-.01	.00	.24**	.29**	1			17.46 (5.52)	6 – 30
8. CESD-10	.16**	-.12**	-.03	-.08*	.13**	.20**	.39**	1		12.38 (4.23)	0 – 30
9. RSES	.02	.04	.05	.03	-.03	-.08*	-.20**	-.40**	1	19.28 (4.56)	0 – 30

Note. ** $p < .01$, * $p < 0.05$; Mean, standard deviation, and possible range of scores are provided for primary measures.

3.4. Variables predictive of problematic Internet use

Four sets of hierarchical linear regressions were computed to investigate whether any of the demographic or psychopathological variables predicted PIU and its factors. In hierarchical regression analyses, a determination of R^2 change between multiple models is computed. Thus, the magnitude of change in the amount of variance explained in a dependent variable between separate blocks of independent variables can be calculated. The data met all the necessary assumptions required of a linear regression analysis: variables measured on a continuous scale, a linear relationship between the dependent and independent variables was present (determined by inspection of a scatterplot), independence of observations (all Durbin-Watson values < 1.95), homoscedasticity, and the residuals of the regression line were approximately normally distributed.

Analyses were conducted by specifying a priori blocks of predictor variables. The demographic variables were included in block 1 (age, sex, educational level, and marital status), the two Internet use variables in block 2 (daily duration of Internet use and the subjective PIU question), and finally, the two psychopathological variables were included in block 3 (depression and self-esteem). The total PIUQ score and each of its three factors were used as outcome variables. Analyses are reported in turn for each outcome variable.

First, for the total PIUQ score, the overall model was not significant at step 1 with none of the demographic variables emerging as significant predictors. At step 2, the model was significant with the inclusion of the Internet use variables; both duration of daily online time ($p < .001$), and subjective report of excessive use ($p < .001$) were significant. Step 3 of the model was significant with depression emerging as a significant predictor ($p < .001$). Second, for the obsession factor, the model was not significant at step 1. With the inclusion of hours spent online ($p = .004$) and subjective report of excessive use ($p = .004$) in step 2, the model was significant. In step 3, higher levels of obsession were significantly predicted by elevated levels of depression ($p < .001$). For neglect, the model was significant at steps 2 and 3 with the following variables emerging as statistically significant predictors: higher levels of depression ($p < .001$), a greater number of daily hours spent online ($p < .001$), and participants' subjective report of excessive use ($p < .001$) were predictive of higher neglect scores. Lastly, the predictive model for the control factor was also significant at steps 2 and 3 with depression ($p < .001$), low self-esteem ($p < .05$), time spent online ($p < .001$), and participants' subjective report of excessive use ($p < .001$) emerging as significant predictors. Table 3 illustrates the results of these linear regression analyses.

3.5. Variables predictive of problematic Internet use in the clinical range

The demographic and psychopathological variables were subjected

Table 3
Predicting Overall PIU, and Obsession, Neglect, and Control Factors for the complete sample.

Variables	Overall PIU		Obsession		Neglect		Control	
	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.	Estimate	S.E.
<i>Model 1</i>								
Sex	-.02	.57	-.03	.21	.02	.19	-.02	.21
Age	-.04	.16	-.03	.06	-.10	.06	-.01	.06
Education	-.01	.23	.00	.09	-.04	.08	.00	.08
Marital status	.05	.87	.10	.33	-.00	.29	.01	.32
<i>Model 2</i>								
Time spent online	.18**	.06	.15*	.02	.14**	.02	.16**	.02
PIU Subjective Q	.21**	.30	.21*	.11	.16**	.10	.17**	.11
<i>Model 3</i>								
CESD-10	.30**	.06	.31**	.02	.25**	.02	.20**	.02
RSES	-.05	.05	-.06	.02	.06	.02	-.08*	.02

Note. ** $p < .01$, * $p < 0.05$.

to binomial logistic regression analyses to determine whether any of these predicted PIU in the clinical range (i.e. higher than the cut-off score indicative of clinical PIU). A PIUQ-clinical outcome variable was created by dichotomizing PIUQ scores resulting in a categorical variable with two levels (scores either below or above the cut-off score of 22). Scores for the three factors (obsession, neglect, and control) were also dichotomized to create categorical variables but, in the absence of any recommendations of cut-off scores for the factors, the practice of El Asam et al. (2019) was followed by creating two levels, scores below the 80th percentile were regarded as within the normal range for the variable and scores at or above the 80th percentile were regarded as falling in the clinical range. The data met all the necessary assumptions required of a logistic regression analysis: a dependent variable measured on a dichotomous scale with mutually exclusive categories, independence of observations, and a linear relationship was present between the continuous independent variables and the logit transformation of the independent variable (examined using the Box-Tidwell test for linearity). The results for each of the four outcome variables are described in turn below.

First, for the total PIUQ outcome, the overall model with the inserted predictors was significant, $\chi^2(8) = 86.14, p < .001$, Nagelkerke $R^2 = .16$, and the likelihood of scoring in the clinical range on the PIUQ was predicted by the following variables: longer periods of time spent online each day ($p = .007$), those who self-reported as engaging in excessive online activity ($p < .001$), those who exhibited higher depressive symptoms ($p < .05$), and those with lower self-esteem ($p = .001$). Then, when obsession scores were examined, the model was significant ($\chi^2(8) = 37.75, p < .001$, Nagelkerke $R^2 = .09$) and only depressive symptoms ($p < .05$) and participants' subjective report of problematic use ($p < .001$) emerged as predictors. The third model, which tested predictors of the neglect factor, was significant ($\chi^2(8) = 26.68, p = .001$, Nagelkerke $R^2 = .06$), and demonstrated that higher neglect scores were predicted by participants who were younger in age ($p < .05$), spent a greater amount of time online ($p < .05$), and by those who reported excessive use ($p < .05$). Lastly, higher control scores ($\chi^2(8) = 30.16, p < .001$, Nagelkerke $R^2 = .06$) were predicted by increased duration of time spent online ($p < .05$), subjective report of problematic use ($p < .05$), and elevated depression scores ($p < .05$). The results of these logistic regression analyses are illustrated in Table 4.

4. Discussion

The present study investigated the prevalence of PIU among a sample of college-aged young adults resident in the UAE. Moreover, associations between PIU, Internet use, a range of demographic variables, and depression and self-esteem were examined.

The present study finds that a staggering 58.4% of the sample

Table 4
Predicting Overall PIU, Obsession, Neglect, and Control Factors in the Clinical (At-risk) range.

Variables	Overall PIU			Obsession			Neglect			Control		
	B	S.E.	Wald	B	S.E.	Wald	B	S.E.	Wald	B	S.E.	Wald
Sex	.12	.20	.36	.17	.25	.47	-.18	.24	.52	.26	.22	1.38
Age	-.07	.06	1.38	-.16	.09	3.17	-.24	.09	6.34*	.04	.06	.33
Education	.11	.08	1.59	.15	.12	1.77	.10	.11	.89	-.03	.09	.14
Time spent online	.06	.02	7.23**	.02	.02	.85	.05	.02	5.83*	.05	.02	5.71*
PIU Subjective Q	.54	.12	20.58**	.50	.12	17.67**	.28	.12	5.83*	.31	.11	7.85**
CESD-10	-.78	.19	17.52**	-.60	.26	5.18*	-.24	.23	1.16	-.49	.22	4.84*
RSES	-.07	.02	10.56**	-.03	.02	1.61	.02	.02	.50	-.03	.02	1.99
Nagelkerke R ²	.155			.086			.057			.062		

Note. ** $p < .01$, * $p < .05$; CESD-10 = Centre for Epidemiological Studies Depression Scale; RSES = Rosenberg Self-esteem Scale.

exhibited PIU in the at-risk range. This is, to date, the highest determination of PIU point prevalence. It far exceeds any previous account in any other region of the world, where estimates have generally ranged from 1% to approximately 20% (Ha et al., 2007; Mei et al., 2016; Petersen et al., 2009; Tsai et al., 2009; Weinstein et al., 2014). It is generally accepted that prevalence rates for PIU vary widely given that studies elect to focus on different target groups, adopt varying operational definitions of PIU, and consequently assess the construct using different assessment measures which collectively introduce variation. But the present study's prevalence result is equally high when compared to the PIUQ validation study of Demetrovics et al. (2016), which found that 14.4% of their European sample produced scores in the at-risk PIU range. The finding of a prevalence rate that is measurably higher than any previous estimation is most likely the result of a number of potential factors. First, the explicit focus on a young adult sample. It is well-established that adolescents and young adults demonstrate a greater tendency towards engaging in risky behaviors that exceed the bounds of adaptive functioning. Moreover, for most young people in contemporary societies, their primary means of communication with others and interaction with the world is electronic. The ubiquity of the Internet and the plethora of available and versatile online-mediated activities allow individuals to live almost entirely in digital spaces. Therefore, for some, a dependency on technology may ensue. Contextual factors specific to the UAE could also be implicated in explaining the high prevalence finding. The UAE is a country characterized by rapid transformation across all spheres of society, technological advancement, socio-economic stability, and infrastructural development which have collectively resulted in greater access to the Internet, financial stability, and an overt focus on the varying applications of technology, online and otherwise (Vally & El Hichami, 2019). A further issue related to the PIUQ assessment measure that requires attention is the currently recommended cut-off score for determining clinically relevant PIU. Despite using the recommended cut-off score, this may not be appropriate for use with this particular sample as it may be overly sensitive and therefore result in a larger proportion of participants falling in the clinical range, a result that may not be the case if a sample-specific cut-off score were to be used.

Contrary to previous studies, PIU severity was not related to any of the demographic variables examined. PIU did not vary as a result of age, sex, marital status, or level of education. This was the case when mean scores were compared, at a correlational level, and following regression analyses. The literature has consistently found age and gender-related differences in PIU with the behavior being more prevalent among males and those of a younger age (Ioannidis et al., 2018; Mei et al., 2016; Tsai et al., 2009). In the current study, when the sample was stratified into two age-defined subgroups, PIU did not significantly differ which is a finding that contradicts the literature. This may potentially be the result of the inequitable size of these sub-samples. Moreover, the sub-samples were also not equivalent with regard to any of the other demographic variables. Specifically, in relation to the observed gender-related differences in the literature, the reasons that

underpin these differences are not well understood. But one potential hypothesis posits that males and females engage in different activities in the online world and these particular preferences may potentially be related to the differences in PIU scores (Mei et al., 2016). The current study did not specifically assess participants' online behaviors (e.g., online chatting, or gaming, or media streaming etc.). Assessment of specific online behaviors remains a sensible course of action for future studies. Alternatively, PIU may simply impact individuals uniformly, in relation to both age and gender, in this region of the world.

Two variables that emerged as significantly related to PIU, although moderately so, were the duration of daily online use and participants' subjective perception of their online behavior as excessive. These are unsurprising findings and concur with the literature. The inability to engage in self-control and restrain one's engagement in an activity is an element of addictive behaviors (Gaillet & Baumeister, 2007). Empirically as well, it has also been established that an increasing duration of Internet use is associated with a commensurate and increasing risk for PIU, however this relationship appears stronger for computer use than for mobile phone use (Moreno, Jelenchick, & Breland, 2015). Thus, the relationship between duration of use and PIU risk may be mediated by the preferred type of online activities engaged in. This type of analysis, however, was not possible given the current dataset.

A demonstrated relationship between PIU and depression was evident, although this relationship was not substantial in terms of magnitude. Depressive symptoms consistently predicted overall PIU, and each of its three factors, as well as PIU scores in the clinical range, in addition to clinical scores on the sub-factors (with the exception of neglect). Associations were strongest for the overall PIUQ score than for any individual factor. For individuals who experience depression, detachment from significant social relationships and avoidance of in-vivo social engagement is common. This social isolation may propel individuals to direct their attention more overtly towards online activities. This process may be amplified as depression appreciates in severity thus, potentially, manifesting in dependent behavior. Moreover, some depressed individuals display a preference for seeking support via online-mediated interactions, in the form of posting on mental health blogs and forums (Moreno et al., 2015). One such study found the preference for online activities to have persisted as far as one year following the initial determination of depressive symptoms (Gámez-Guadix, 2014). Furthermore, a self-perpetuating cycle has been proposed in which depressed individuals are drawn to engage in online interactions, and a combination of deficits in self-regulation and a negative cognitive bias precipitate PIU (Moreno et al., 2015). Specifically, LaRose, Lin, and Eastin (2003) posit that depressed individuals direct their attention towards the Internet, first, to seek a readily available source for relieving their experienced lack of social stimulation and, second, to gain access to content that might elevate their mood. But these individuals also experience an inability to engage in self-regulation and thus PIU emerges.

For young adults, an additional factor that may further stimulate the development of PIU after being drawn towards online activities is the

tendency for some individuals to engage in upward and downward social comparisons. Particularly for those who use social media as a primary means for social engagement, research has demonstrated that young people compare the idealized presentations depicted online with their own lives and are unable to interrogate the validity of the online depictions (Nesi & Prinstein, 2015). Consequently, depression may follow or be compounded for those who are already experiencing such difficulties. This proposition gains further credibility when one considers that generalized PIU appears to be strongly correlated with social media addiction (Montag et al., 2015).

Individuals who reported low self-esteem were more likely to be at risk for PIU. This association was evident both via correlational analysis and following logistic regression. This concurs with previous studies that have found low self-esteem to be a risk factor for PIU (Kim & Davis, 2009; Mei et al., 2016; Stieger & Burger, 2010; Widianto & Griffiths, 2011). It has also been posited that self-esteem is a reliable measure of overall psychological well-being, which research has also shown to be negatively associated with PIU (El Asam et al., 2019). Gaillot and Baumeister (2007) suggest that demanding environmental circumstances or intrapsychic psychological conditions such as chronic and persistent low self-esteem limit individuals' capacity for self-regulation, manifesting as diminished self-control, and thus, a susceptibility to the development of addictive behavior. There is some evidence to suggest that this may be likely. Lower self-esteem prospectively predicts a greater likelihood of health problems at two months follow-up and this effect is partially mediated by the poor quality of social relationships that often accompany individuals with low self-esteem (Stinson et al., 2008). It is of particular importance to note that this study employed a measure of explicit self-esteem (an individual's conscious attitudes towards the self) rather than implicit self-esteem (automatic and unconscious representations of attitudes towards the self). This is noteworthy given that Stieger and Burger (2010) have previously reported that individuals who scored highly on an Internet addiction test possessed low explicit but high implicit self-esteem. It appears that these two variants of self-esteem are differentially impacted by PIU behavior.

4.1. Limitations

This study was cross-sectional in nature and therefore investigation of the temporal relationships between the variables was not possible. Future work is needed that incorporates multiple assessment points so that the factors that increase risk for PIU can be better understood. This study only employed a measure of generalized Internet use and did not assess the specific and varying types of online activities that participants engaged in. This is an important and acknowledged omission. Davis' (2001) cognitive-behavioral model of Internet addiction first proposed that Internet use, and indeed PIU, is a multifaceted, heterogeneous construct. The model posited that PIU may be either specific, in which the individual pathologically uses the Internet for a specific purpose or generalized which consists of a global set of behaviors (Davis, 2001). The model has since been empirically verified as several studies have identified distinct differences in the presentation of PIU when studies elect to assess either generalized or specific measures of use (Montag et al., 2015). This study's decision to assess the generalized variant of PIU is therefore an especially important limitation given these findings. Moreover, varying predictive relationships between different types of online activities (e.g., gaming, social networking, instant messaging etc.) and demographic and psychological variables (e.g., depressive symptoms) may potentially be uncovered. Similarly, the inclusion of a measure of explicit self-esteem only is a limitation considering the previous literature that has reported a differential relationship between PIU and both explicit and implicit self-esteem. It would be a worthwhile endeavor to provide additional data on the nature of this relationship. The sample with which this study was conducted was limited to university students in the young adult age range. The sample therefore is not necessarily representative of the

demographic characteristics of the country at large. Variations in education level, socio-economic status, access to technology, and rural/urban residential settings is likely, and, thus would invariably introduce variation in the study's results. A further limitation is this study's reliance on self-report measures which are potentially limited by participants' need for social desirability and/ or the accurate recall of their responses.

5. Conclusion

This is the first study to report on the prevalence of PIU in a sample from the Arabian Gulf region. The study provides an initial investigation into the association between psychological variables and PIU. The extent of the determination of those at risk for PIU in this sample suggests that PIU may pose a serious risk for residents in this locale. Further investigation is needed to understand the causes of the phenomenon such that this might inform the development of prevention and remediation strategies.

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