



## Problematic Internet use in British adolescents: An exploration of the addictive symptomatology



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### ABSTRACT

Research into online addictions has increased substantially over the last decade, particularly amongst youth. This study adapted the Problematic Internet Entertainment Use Scale for Adolescents [PIEUSA] for use with a British population. The adapted scale was used to (i) validate the instrument for English-speaking adolescent samples, (ii) estimate the prevalence of adolescent online problem users and describe their profile, and (iii) assess the accuracy of the scale's classification of symptomatology. A survey was administered to 1097 adolescents aged between 11 and 18 years. The results indicated that (i) reliability of the adapted scale was excellent; factor validity showed unidimensionality, and construct validity was adequate. The findings also indicated that (ii) prevalence of online problem users was 5.2% and that they were more likely to younger males that engaged in online gaming for more than two hours most days. The majority of online problem users displayed negative addictive symptoms, especially 'loss of control' and 'conflict'. The adapted scale showed (iii) very good sensitivity, specificity, and classification accuracy, and was able to clearly differentiate between problem and non-problem users. The results suggest certain differences between adolescent and adult online problem users based in the predominance of slightly different psychological components.

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### 1. Introduction

Over the last decade, research into the negative effects of excessive online use has greatly increased (Kuss, Griffiths, Karila & Billieux, *in press*). Those who have researched into the maladaptive and detrimental effects of Internet use have conceptualized the phenomenon in a number of different ways including "Internet Addiction" (IA; Griffiths, 1998, 2000; Young, 1996), as distinct from "Excessive Internet Use" (EIU; Hansen, 2002; Weinstein & Lejoyeux, 2010), and "Problematic Internet Use" (PIU; Caplan, 2002; Shapira, Goldsmith, Keck, Khosla, & McElroy, 2000) with addictive characteristics. In the appendix of the new Diagnostic and Statistical Manual for Mental Disorders (DSM-5) the American

Psychiatric Association (American Psychiatric Association, 2013a) has taken a cautious position, proposing "Internet Gaming Disorder" (IGD; American Psychiatric Association, 2013b), also referred to as "Internet Use Disorder" (IUD; Petry & O'Brien, 2013), that covers the rest of the related terms.

EIU among adolescents has been identified as a possible psychosocial problem (Wang, 2001; Widianto & Griffiths, 2009). However, it has been recently noted that most studies estimating the prevalence of adolescent problematic users have been performed with psychometric instruments originally designed for adults (Lopez-Fernandez, Freixa-Blanxart, & Honrubia-Serrano, 2013). The question of how some teenagers develop maladaptive Internet use has been addressed during the last decade in several countries. For instance, a recent systematic review of IA studies published (in the English language) since 2000 (Kuss et al., 2013) identified 40 studies examining adolescent IA. This included seven studies that had used the *Internet Addiction Test* (IAT; Young, 1998a), 11 studies that have used the *Internet Addiction Diagnostic Questionnaire* (IADQ; Young, 1998b), nine studies using the *Chen Internet Addiction Scale* (CIAS; Chen, Weng, Su, Wu, & Yang, 2003), and 13 studies using a variety of other measurement instruments such

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as the *Compulsive Internet Use Scale* (CIUS; Meerkerk, Van Den Eijnden, Vermulst, & Garretsen, 2009). However, despite PIU in adolescents being acknowledged by many scholars as an international issue, controversy remains regarding the border between EIU (abuse of this technology-based behavior) and possible pathology (PIU, IA, IGD or IUD). Furthermore, there are still unanswered questions about the nature of the underlying mechanisms, and the indicators for measurement, that play a role in the transformation from a healthy enthusiasm of online entertainment to an addictive and/or problematic mental disorder (Spekman, Konijn, Roelofsma, & Griffiths, 2013).

The IGD symptomatology recently proposed by the APA is common to the addictive syndromes included in the previous DSM (i.e., DSM-IV-TR; American Psychiatric Association, 2000), as well as being similar to the only existing adolescent IA diagnostic criteria (i.e., Ko, Yen, Chen, Chen, & Yen, 2005; see Table 1). The nine IGD potential criteria, according to Petry and O'Brien (2013), are derived from other empirical research reports, such as the IA diagnostic criteria proposed by Tao et al. (2010). Previous to this work on IA, other authors have proposed classifications to detect Internet problem users by applying a variety of criteria (e.g., Beard & Wolf, 2001; Block, 2008; Pies, 2009; Shapira et al., 2003). However, all of these proposed classifications are specifically related to adult Internet use. At present, only one scale for PIU has been designed exclusively for adolescents and has been clinically validated with the adolescent IA diagnostic criteria (CIAS; Ko et al., 2005). Therefore, it can be argued that the addictive symptomatology that is common to the main addictive disorders included by the APA, as well as the IA criteria proposed by Tao et al., 2010 (which according to Petry and O'Brien (2013) was the main source of the DSM-5's IGD criteria) are (in order of co-occurrence): tolerance, withdrawal and to have jeopardized activities or relationships (also recognized as conflict or functional impairment), preoccupation, persistence (as loss of control), and continued use despite knowledge of problems (a type of conflict too); among other complementary symptoms (i.e., to escape, to lie/deceive, to break rules/laws and to be longer periods than was intended/excessive time).

Recently, two systematic reviews examining the psychometric properties of online addiction assessment tools have been carried out for generalized IA (Lortie & Guitton, 2013) and pathological video-gaming (King, Haagsma, Delfabbro, Gradisar, & Griffiths, 2013). Lortie and Guitton (2013) found that the central symptomatology components in scales assessing IA were compulsive use (including excessive use and loss of control) and negative outcomes (as side effects and conflict), typically accompanied by salience (anticipation and preoccupation). However, the instruments they analyzed were almost exclusively designed for adults (only two out of 14 of the selected questionnaires specifically addressed adolescents). Similarly, King et al. (2013) analyzed the diagnostic features of video-gaming addiction scales in detail. They reported that the most common symptomatology components were (in order of co-occurrence): conflict (appearing in all the scales associated to interpersonal relationships), withdrawal, cognitive salience and loss of control. However, if only adolescent scales are selected (i.e., 8 out of 18 instruments identified in the comprehensive review by King et al., 2013), a different profile for adult and adolescent addiction criteria occurs. In adolescent video game addiction scales, the core components of addictive symptomatology (in order of co-occurrence) were: conflict (linked to school and relationships), followed by loss of control, withdrawal and tolerance. In adult video game addiction scales, the core addiction components (also in order of co-occurrence) were: conflict (in relationships) and withdrawal as primary symptoms, followed by loss of control and tolerance.

Research on adolescent PIU dates back to case study accounts by Griffiths between 1996 and 2000 (Griffiths, 1996, 2000), and

survey research in 2001 by Tsai and Lin (2001). The first scale specifically designed to measure PIU in adolescents was the CIAS, published in 2005 (Ko et al., 2005). Since then, additional scales have been created and validated (e.g., *Internet Addiction Scale* for Turkish high school students (IAS; Canan, Ataoglu, Nichols, Yildirim, & Onder, 2010); *Problem Internet-Use Screening Tool* (SCREEN; Chow, Leung, Ng, & Yu, 2009); *Internet Dependence Scale* (IDS; Gunuc & Kayri, 2010); *Scale for Internet Addiction of Lima* (SIAL; Lam-Figueroa et al., 2011); *Adolescent Pathological Internet Use Scale* (APIUS; Lei & Yang, 2007); and the *Problematic Internet Entertainment Use Scale for Adolescents* (PIEUSA; Lopez-Fernandez et al., 2013). However, some of these newly developed instruments are not in English. Furthermore, almost all of these scales have been based on previous DSM criteria for substance use and/or gambling, as well as criteria based on that found in the empirical IA literature. In these generalized IA scales, the main symptoms analyzed (in order of frequency) are: withdrawal, tolerance, compulsive use, salience, conflict, loss of control and other symptoms such as relapse and mood modification. Regarding their main psychometric properties, their reliability has shown reasonably good consistency (between 0.79 and 0.94), as well as good factor and construct validity. Finally, almost all of these scales have proposed cut-off points to detect adolescent problem users, although – with the exception of the CIAS – they still require clinical validation. More than 50 epidemiological studies have been conducted with adolescents, though relatively few in Europe (Durkee et al., 2012; Kuss et al., 2013) and none in the United Kingdom (UK) and thus provides one of the rationale for carrying out the present study. The estimated prevalence of PIU adolescents measured with scales exclusively created for this age group ranges between 10.1% (Kayri & Gunuc, 2010) and 20.7% (Yen, Yen, Chen, Chen, & Ko, 2007).

The present study had three aims. These were to: (1) validate the PIEUSA (Lopez-Fernandez et al., 2013) for English-speaking adolescent samples; (2) estimate the prevalence of adolescent online problem users and describing the characteristics of problem users in comparison to non-problematic Internet users; and (3) assess the accuracy of the scale's classification of symptomatology in relation to sensitivity, specificity, and overall precision of criteria proposed in the scale.

## 2. Method

### 2.1. Participants and procedure

A convenience sample comprised pupils from five secondary schools in London (UK), who volunteered to complete a questionnaire. Of these, only 71.8% correctly completed all the PIEUSA items (i.e., 1097 out of 1528 participants). Permission was sought from the head teachers, teachers and students, and anonymity and confidentiality was ensured. Formal approval was given by the *Ethics Committee of the Tower Hamlets Research and Performance Development Team*. The paper-and-pencil questionnaire comprised self-report responses collected over a one-hour period during a classroom lesson, in the presence of the pupils' class teacher.

The participants were aged between 11 and 18 years ( $M = 13.52$ ,  $SD = 1.535$ ), with more than half (56%) being male. The sample came from families with an average of five members including the adolescent ( $M = 5.20$ ,  $SD = 1.934$ ). Three-quarters (73.4%) lived in central London, and in most cases parents were in employment (76.5% of fathers and 48.9% of mothers) and had completed secondary school (59% of fathers and 53.2% of mothers). Most of the participants in the final sample (90.2%) were aged between 11 years (year 7), and 15 years (year 11). Only 12.3% reported alcohol and/or tobacco consumption, and 27.3% said they only used technology-based entertainment.

**Table 1**

Comparison of main addictive disorders which supported classifications of PIU symptomatology (substance-related dependence, pathological gambling, and internet gaming and addiction disorders: ordered by symptoms commonalities).

Substance-related disorders: Substance dependence (DSM-IV-TR; American Psychiatric Association, 2000)	Impulse-control disorders: Pathological gambling	Internet Gaming Disorder (DSM-5 appendix, Section III; APA, 2013a,b)	Proposed adolescent diagnostic criteria for Internet Addiction (Ko et al., 2005)
Minimum 3 symptoms occurring in 12-month period:	Minimum 5 symptoms:	Minimum 5 symptoms, and it causes clinically significant impairment:	Minimum 6 symptoms occurring in 3-month period, and at least 1 symptom of Functional Impairment (FI):
(1) Tolerance	(1) Is preoccupied with gambling	(A) Preoccupation with Internet gaming <sub>±</sub> (salience)	(1) Preoccupation with Internet activities
(a) a need for increased amounts of the substance to achieve desired	(2) Needs to gamble with increasing amounts of money to achieve the desire	(C) Tolerance: the need to spend increasing amounts of time engaged in Internet gaming*	(3) Tolerance: increase in the duration of Internet use needed to achieve satisfaction
(b) markedly diminished effect with use of the same amount of the substance	(4) Is restless or irritable when attempting to cut down or stop gambling	(B) Withdrawal: symptoms when Internet is taken away <sub>±</sub>	(4) Withdrawal:
(2)Withdrawal	(5) Gambles as a way of escaping from problems or of relieving a dysphoric mood	(G) Use of the Internet gaming to escape or relieve a dysphoric mood*	(i) symptoms of dysphoric mood... after several days without Internet
(a) the withdrawal syndrome for the substance	(3) Has repeated unsuccessful efforts to control, cut back or stop gambling	(D) Unsuccessful attempts to control Internet gaming use*	(ii) use of Internet to relieve or avoid withdrawal symptoms
(b) substance is taken to relieve or avoid withdrawal symptoms	(9) Has jeopardized or lost a significant opportunity because of gambling	(I) Has jeopardized or lost a significant relationship, job or educational or career opportunity because of the Internet gaming use*	(5) Use of Internet for a period of time longer than intended
(3) Larger amounts or over a longer period than was intended	(6) After losing money, often returns to get even	(F) Loss of interests (...) as a result of, and with the exception of Internet gaming use*	(6) Persistent desire and/or unsuccessful attempts to cut down or reduce Internet use
(4) Persistent desire or unsuccessful efforts to cut down or control	(7) Lies to others	(E) Continued excessive Internet use despite knowledge of negative psychosocial problems*	(7) Excessive time spent on Internet activities and leaving the Internet
(5) Time spent in activities to obtain it, use it or recover	(8) Has committed illegal acts	(H) Has deceived family members, therapists, or others regarding the amount of Internet gaming	(8) Excessive effort spent on activities necessary to obtain access to the Internet
(6) Important activities are given up or reduced	(10) Relies on others to relieve a financial situation		(FI.1) Recurrent use resulting in a failure to fulfill obligations
(7) Continued use despite knowledge of having problems			(FI.2) Impairment of social relationships
			(9) Continued heavy use despite the knowledge of having persistent or recurrent physical or psychological problems
			(FI.3) Behavior violating school rules or laws

Note: In IGD has been added information related with one of the main proposals to behavioural addiction: \*Tao et al., 2010: IA must have the symptoms pointed out as <sub>±</sub> plus at least one of the FI symptoms; lasted 3 months with at least 6 h of Internet usage (non-business/non-academic) per day, and as Ko et al. (2005), IA is not better accounted for by psychotic or bipolar I disorders.

## 2.2. Measures

### 2.2.1. Instrument

The questionnaire comprised three sections: (a) socio-demographic and educational data; (b) features related to Internet usage; and (c) the problematic Internet use scale (PIEUSA) adapted for British adolescents.

The variables examined in the socio-demographic section included: gender; age, (categorized as young [11–14 years] or older adolescents [15–18 years]); the family unit (i.e., number of people living in the participant's home); the parents' educational level (primary, secondary or higher education); parents' employment status; participant's place of residence (central or greater London); school level (from year 7 to 13, age 11 to 17); alcohol and/or tobacco usual consumption; and whether they used other forms of entertainment that did not involve technology.

In relation to their Internet use, all participants were asked about two main forms of entertainment: their use of social networking sites (SNSs), and the playing of online video games (OVGs). They were also asked their initial age of Internet use, their preferred kind of use (alone, or in company, virtually or physically), their weekly Internet use frequency (days per week and hours per week), as well as the minimum and maximum time per typical session (in minutes). In reference to their perception as users, they were asked whether Internet use affected them in some way (either positively or negatively), and their main purpose in using it as a leisure activity (i.e., self-entertainment, sociability, or other reasons). Their self-perceived level of expertise (Likert scale from 1, "non-expert", to 5, "highly expert") was also recorded.

The PIEUSA is a validated scale constructed originally in Spanish (Lopez-Fernandez et al., 2013). It contains 30 items rated on a seven-point Likert scale (from 1 "strongly disagree" to 7 "strongly agree"). The total score ranges between 30 and 210, with the highest score being the maximum presence of the construct under study over the last year. The scale covers the following eight symptoms (based on Ko et al., 2005; Tao et al., 2010): preoccupation, withdrawal, tolerance, loss of control, persistence although negative life consequences, conflict (interpersonal and intrapersonal, following Griffiths, 2000), evasion from problems, and a dimension regarding other (social) motivations (Bianchi & Phillips, 2005). The adaptation for British adolescents was performed through the forward and backward translation (Sánchez-Moreno et al., 2005), validated by Spanish and British experts in language and culture, addiction and education, in order to ensure the cultural and semantic equivalence of the scale items.

### 2.2.2. Psychometric properties of PIEUSA

The factor validity of this first scale adaptation was assessed by an exploratory factor analysis (EFA) using the principal components technique, with the Kaiser–Mayer–Olkin index (KMO) and Bartlett's test of sphericity to confirm the adequacy of the sample and procedure respectively. The analysis yielded one factor with eigenvalues above 1 (factor loading > 0.4) to obtain an acceptable factor based on its explained variance. Internal consistency was estimated through the Cronbach's alpha coefficient and an item analysis. Construct validity was obtained through associations of the total score with several indicators associated with Internet time spend.

### 2.2.3. Epidemiological analysis

Sub-samples were generated randomly to compare different users' categories in relation to the items and symptomatology proposed in the PIEUSA, as well as to estimate sensitivity, specificity, and classification accuracy.

### 2.2.4. Software for data analysis

All statistical analyses were performed using PASW 18.0.

## 3. Results

### 3.1. Psychometric study of the PIEUSA adapted for British adolescents

The PIEUSA distribution showed a slightly positive asymmetry (.421) with the central scores around 100 ( $M = 99.70$ ,  $Mdn = 99.00$ ). Variability was relatively high ( $SD = 39.31$ ,  $Range = 180$ , from 30 to 210). Three extreme cases appeared with scores of 204 or above.

#### 3.1.1. Factor validity

The factor validity of the British adaptation with EFA (KMO = 0.964; Bartlett's test:  $\chi^2(435) = 17225.505$ ;  $p < .001$ ) yielded one factor with eigenvalues above 1 and factor loadings greater than 0.4 (see Table 2). The factor "internet entertainment use among British adolescents" explained 41.5% of the total variance.

#### 3.1.2. Item analysis and internal consistency

Results highlighted in Table 2 show a great variability in the scores on each item. Few presented high ( $M > 4$ ,  $SD \leq 2.2$ ,  $Mdn \geq 4$ ; items 2 and 16) or low scores ( $M < 2.6$ ,  $SD \leq 2.2$ ,  $Mdn \geq 1$ ; items 23 and 24). With regard to the homogeneity indices, all the items showed the expected correlation with the corrected total score. The lowest was Item 24, although it was above the cut-off point. The removal of the item did not improve the internal consistency, and so it was maintained. Therefore, PIEUSA achieved an excellent reliability, with a Cronbach's alpha of 0.95.

#### 3.1.3. Construct validity

Statistically significant associations were found between the total score and measures of Internet time spend and its main entertainment uses – SNSs or OVGs (see Table 3). Another alternative measure was the adolescents' self-perception of Internet. If it was affecting them in some way, students who answered affirmatively obtained higher scores on the PIEUSA ( $M = 104.83$ ,  $SD = 36.163$ ) compared with those who did not answer affirmatively ( $M = 94.11$ ,  $SD = 33.846$ ) ( $t_{(676)} = 3.803$ ,  $p < .001$ ,  $r = 0.01$ ).

### 3.2. Profile of problematic users according to the PIEUSA

#### 3.2.1. Descriptive profile

Problem use was classified according to the statistical criteria applied by Chow et al. (2009). This was similar as that used in the literature on gambling addiction (i.e., the 15th, 80th and 95th percentiles to classify occasional, habitual, at risk, and problem use respectively). These categories correspond to scores of 57, 129 and 172 on the British adaptation of the PIEUSA. The analysis revealed that 14.2% of participants were occasional users ( $Mdn = 43$ ), 65.3% were habitual users ( $Mdn = 95$ ), 15.3% were at risk of problematic use ( $Mdn = 145$ ), and 5.2% were problematic users ( $Mdn = 187$ ). There were significant differences between the four categories ( $H: Z(3) = 784.083$ ,  $p < .001$ ), as well as between each pair, supporting the suitability of this categorization.

Among those classified as problematic users ( $n = 57$ ), 68% were male, 75% belonged to the younger age group ( $M = 13.25$ ,  $SD = 1.619$ ), 82.1% were from central London, and 75.4% were studying in non-private schools (71.9%: years 7 and 9). Only 28.1% consumed alcohol and/or tobacco, 35.1% only used entertainment with technological support, and 60.7% considered themselves to be either fairly or highly expert. They accessed an average of three SNSs ( $M = 3.80$ ,  $SD = 2.238$ ), that in order of

**Table 2**

Item analysis and internal consistency in PIEUSA for British adolescents (N = 1097) (item number, its statement, mean, standard deviation, median, item factor load, corrected item-total correlation, and Cronbach alpha if item is deleted).

Item no.	PIEUSA item statement (British adaptation)	M	SD	Mdn	Factor load	Corrected item-total <i>r</i>	Cronbach $\alpha$ if item deleted
1	When I am not in class, I usually think about OVG and/or SNS (the last time I played or enjoyed my scores or friends, my previous sessions, etc.)	2.89	1.854	3.00	.654	.623	.949
2	When I play/enjoy myself online I spend more time than I had planned	4.52	1.934	5.00	.523	.495	.950
3	When I finish playing, I look forward to my next session of entertainment with OVG and/or SNS	3.43	1.974	3.00	.638	.606	.949
4	When I begin accustomed to playing a game or to an entertainment website, I need more time to derive enjoyment than I did at first	3.68	1.858	4.00	.618	.587	.949
5	When I play OVG or visit SNS, I can forget my homework	3.78	2.167	4.00	.560	.530	.950
6	When I play OVG or visit SNS, I can forget my household chores (making my bed, washing dishes, walking the dog, etc.)	3.24	2.074	3.00	.545	.514	.950
7	When I play OVG or visit SNS, I can forget everything	2.60	1.982	2.00	.657	.626	.949
8	When I play OVG or visit SNS I become very tense, even a little agitated, trying to answer quickly and correctly	3.13	1.935	3.00	.683	.651	.948
9	When I play OVG or visit SNS, other people (parents, brother/s, sister/s, friend/s, etc.) complain about the length of time I spend	3.81	2.109	4.00	.628	.597	.949
10	I get annoyed when people ask me what I'm doing while I'm playing OVG or visiting SNS	3.58	2.151	3.00	.641	.610	.949
11	I have tried not to spend so much time with OVG or SNS, but I find it difficult	3.23	1.988	3.00	.647	.616	.949
12	I am unable to leave a session half-finished, I have to finish somehow	3.57	2.136	3.00	.688	.658	.948
13	When I stop playing it's because I just can't go on and have been playing for one or more hours	3.32	2.080	3.00	.594	.560	.949
14	When, for any reason, I have to stop playing before I want to, I get irritable, nervous, in a bad mood, tired... is short, I feel bad.	2.83	1.973	2.00	.691	.657	.948
15	OVG or SNS help me to forget my daily problems for a while and just enjoy myself	3.86	2.068	4.00	.619	.587	.949
16	A world without OVG or SNS would not be fun	4.18	2.189	4.00	.553	.523	.950
17	I have met new people through this kind of entertainments (OVG or SNS)	3.92	2.184	4.00	.589	.564	.949
18	Through this kind of entertainment (OVG or SNS) I have made new friends	3.89	2.132	4.00	.584	.559	.949
19	I have occasionally got hooked on this kind of entertainment (OVG or SNS): when the video game is new, during the holidays, when I meet something or someone new through SNS, etc.	3.52	2.066	3.00	.673	.645	.948
20	I have lost my appetite or missed a meal on account of OVG or SNS	2.62	1.987	2.00	.673	.637	.948
21	I have lost sleep due to the time I spend playing OVG or visiting SNS	2.91	2.092	2.00	.694	.660	.948
22	I have told lies about the time I spend on OVG or SNS	2.59	1.981	2.00	.713	.679	.948
23	I have hidden things that I found out through OVG or SNS	2.54	1.997	1.00	.691	.654	.948
24	I have spent money on OVG or SNS entertainment	2.59	2.103	1.00	.527	.490	.950
25	I have sometimes preferred OVG or SNS to being with my friends	2.70	2.010	2.00	.666	.628	.949
26	I have tried everything possible to get more time to play or obtain new video games, friends...	2.73	1.983	2.00	.742	.707	.948
27	When I am playing OVG or visiting SNS it is usual for me to ask my parents/brother(s)/sister(s) to let me play a little longer	3.15	2.100	3.00	.679	.644	.948
28	I get completely absorbed when I am playing online	3.22	2.022	3.00	.759	.727	.948
29	I like to keep up-to-date with anything new in OVG or SNS	3.96	2.134	4.00	.643	.612	.949
30	My main entertainment is OVG or SNS	3.73	2.083	4.00	.671	.639	.948

Note: "Instructions: Please answer each of the following questions about Online Video Games (OVG) and/or Social Networking Sites (SNS) as Internet entertainments used in the past year. In each question you are asked to consider your answers from 1 to 7 in this way: "1" = I strongly disagree, and "7" = I strongly agree."

**Table 3**

Associations between PIEUSA, patterns of Internet use and its entertainments (Kendall's tau-c correlations, the significance value  $p$ , and descriptive statistics: mean, median, standard deviation and range).

	1	2	3	4	5
1. PIEUSA total score					
2. Days per week $\tau$	.134**				
3. Weekly usual hours $\tau$	.166**	.191**			
4. Usual number of SNS $\tau$	.077**	.119**	.190**		
5. Usual number of OVG $\tau$	.096*	.018	.106*	.123**	
M	99.70	2.52	7.08	1.60	3.32
Mdn	99.00	3.00	5.00	2.00	3.00
SD	39.314	2.218	6.731	0.782	1.603
Range (minimum, maximum)	180 (30–210)	6 (1–7)	35 (0–35)	4 (0–4)	10 (0–10)

\*  $p < .01$ .

\*\*  $p < .001$ .

frequency were Facebook (73.6%), Twitter (24.5%), and Flickr (24.5%), as well as playing three OVGs ( $M = 3.05$ ,  $SD = 1.873$ ). Of the total, 72.9% reported having used Internet as regular entertainment during their childhood (initial age:  $M = 7.88$  years,  $SD = 3.105$ ), 73.9% had almost six years' experience of engaging in online entertainment, and most of this subsample preferred to engage in Internet use on their own. In relation to their time spent online, the duration of a typical online session had a mean average of two hours (in minutes:  $M = 149.7$ ,  $Mdn = 120$ ,  $SD = 164.302$ ); 54% went online almost daily (days per week:  $M = 5.50$ ,  $Mdn = 7$ ,  $SD = 2.092$ ), but only 15.6% for more than 15 h weekly (hours per week:  $M = 8.28$ ,  $Mdn = 6.71$ ,  $SD = 7.271$ ). 60.9% stated that the time spent online affected them in some way: positively in communication (47.4%), leisure (31.6%) and learning (10.5%); negatively in terms of potential dangers (42.8%), isolation (25.6%) or addiction (7.1%). Therefore, the main aim of online use was sociability (42%), followed by self-entertainment (31.6%).

### 3.2.2. Comparing non-problem with problematic users with PIEUSA

Three subsamples of 57 non-problem users of each category (occasional, regular and at-risk users) were randomly extracted in order to compare them with problem users. No statistical differences were observed in gender or categories of age between groups. Participants that were classified as problematic users obtained median scores of 7 on all the items. The variability was lower than that of non-problematic users.

To support construct validity, the total scores on the scale were compared with the time of a typical online session, and weekly frequency of connection. Statistical differences were found between the users' categories in both cases (time of regular session in minutes:  $Mdn_{occasional} = 60$ ,  $Mdn_{regular} = 90$ ,  $Mdn_{at-risk} = 100$ ,  $Mdn_{problematic} = 120$ ,  $H: Z(3) = 14.626$ ,  $p < .01$ ; weekly frequency in days:  $Mdn_{occasional} = 3$ ,  $Mdn_{regular} = 4$ ,  $Mdn_{at-risk} = 6$ ,  $Mdn_{problematic} = 7$ ,  $H: Z(3) = 11.763$ ,  $p < .01$ ). However, the Spearman correlation between the two indicators was not consistent across categories ( $r_{occasional} = .388$ ,  $p < .05$ ;  $r_{regular} = .475$ ,  $p < .01$ ,  $r_{at-risk} = .359$ ,  $p < .05$ ;  $r_{problematic} = .225$ ,  $p > .05$ ).

### 3.3. Study of symptoms measured according to the PIEUSA

Following Tao et al. (2010), the incidence of each single and combination symptom was calculated (see Table 4). The most prevalent were "loss of control" (100%) and "conflict" (98.2%), and the least prevalent was "withdrawal" (80.7%). All problem users reported as having three symptoms related to addiction.

#### 3.3.1. Verifying the symptomatology classification in problem users

The sensitivity, specificity, and classification accuracy of the symptoms measured through the PIEUSA were compared between

**Table 4**

Frequency of incidence for each symptom and symptom combination following the diagnostic criteria for IA of Tao et al. (2010) in problem users ( $n = 57$ ).

Symptom/s (number and name; combination)	$n$	(%)
1. Preoccupation	50	(87.7%)
2. Withdrawal	46	(80.7%)
3. Tolerance	55	(96.5%)
4. Loss of control	57	(100%)
5. Persistence	50	(87.7%)
6. Conflict	56	(98.2%)
7. Evasion	51	(89.5%)
8. Motivations	55	(96.5%)
Symptoms 4 and 6 simultaneously	56	(98.2%)
Symptoms 4, 6 and 1 simultaneously	49	(86%)
Symptoms 4, 6 and 2 simultaneously	45	(78.9%)
Symptoms 4, 6 and 3 simultaneously	54	(94.7%)
Symptoms 4, 6 and 5 simultaneously	50	(87.7%)
Symptoms 4, 6 and 7 simultaneously	50	(87.7%)
Symptoms 4, 6 and 8 simultaneously	54	(94.7%)
Any three of eight symptoms simultaneously	57	(100%)

the problem users and a random selection of non-problem users with the same size sample ( $n = 57$ ). This analysis (see Table 5) was also used in another IA study with Greek adolescents (i.e., Siomos, Dafouli, Braimiotis, Mouzas, & Angelopoulos, 2008). The mean average of each group of items that defined a symptom was found, and the percentage agreement was calculated counting the number of participants who gave a rating of 5 or higher to each symptom (a similar procedure used by Phillips, Saling, and Blaszczynski (2008), Lopez-Fernandez et al. (2013)). Furthermore, statistical differences with fairly large effect sizes were observed between problem and non-problem Internet users in reference to each single symptom (see Table 6).

## 4. Discussion

The adaptation of the PIEUSA to an English speaking adolescent population was a psychometric improvement on the original version. It showed excellent reliability, even greater than the Spanish version (Cronbach:  $\alpha_{Spanish} = 0.92$  vs.  $\alpha_{British} = 0.95$ ) and other adolescent psychometric studies (e.g., Ko et al., 2005; Lam-Figueroa et al., 2011; Tsai & Lin, 2001). The scale's factor validity was again consistent with a unidimensional model, achieving greater explained variance than the original version (Spanish: 31.3% vs. British: 41.5%). As regards the construct validity, the association between the total score with measures addressed to detect PIU appears to be small, due in part to the fact that a very conservative analysis technique was used. However, a complementary analysis with the Internet users' categories revealed differences in the duration of each session of online entertainment, with longer duration and higher weekly frequency being associated with higher scores

**Table 5**

Proposal of the classification function of the PIEUSA (N = 114; symptoms, answers of problem and non-problem users, sensitivity, specificity and accuracy).

Symptoms (groups of items; percentage in PIEUSA)	Answers of non-problem users n = 57			Answers of problem users n = 57			Sensitivity	Specificity	Classification accuracy
	M(SD)	n Yes	n No	M(SD)	n Yes	n No			
Preoccupation (items 1, 3; 6.67%)	2.94 (1.46)	6	51	6.11 (1.39)	50	7	87.72	89.47	88.60
Withdrawal (item 14; 3.33%)	2.54 (1.71)	9	48	5.82 (2.05)	46	11	80.70	84.21	82.46
Tolerance (items 4, 26, 27; 10%)	3.06 (1.54)	8	49	6.25 (0.88)	55	2	96.49	85.96	91.23
Loss of control (items 2, 11, 12, 28; 13.33%)	3.50 (1.46)	10	47	6.49 (0.60)	57	0	100	82.45	91.23
Persistence in spite of perception of problems (items 8, 13, 19, 22, 23; 16.67%)	2.74 (1.42)	5	52	6.07 (0.96)	50	7	87.72	91.23	89.47
Conflict (items 9, 10, 20, 21, 25; 16.67%)	2.97 (1.41)	5	52	6.39 (0.59)	56	1	98.25	91.23	94.74
Evasion (items 5, 6, 7, 15; 13.33%)	3.37 (1.46)	11	46	6.17 (1.03)	51	6	89.47	86.25	85.09
Motivations (items 16, 17, 18, 24, 29, 30; 20%)	3.62 (1.44)	10	47	6.50 (0.66)	55	2	96.49	82.50	89.47

Note: between brackets, first, the items concerning to each addictive symptom measured by the PIEUSA, and, second, the proportion of each symptom in the scale expressed in percentage.

**Table 6**

Comparison of the problem and non-problem users (N = 114) in relation with each symptom in the PIEUSA through Mann–Whitney test (*U* statistic, the corresponding *Z*, the significance value *p*, and the effect size *r*).

Symptoms	Non-problem users (n = 57) Mdn	Problem users (n = 57) Mdn	<i>U</i>	<i>Z</i>	<i>p</i>	<i>r</i>
1. Preoccupation	3.00	7.00	253.00	7.88	<.001	.74
2. Withdrawal	2.00	7.00	448.00	6.87	<.001	.64
3. Tolerance	3.00	6.67	141.00	8.46	<.001	.79
4. Loss of control	3.75	7.00	65.50	8.92	<.001	.84
5. Persistence	2.60	6.20	103.50	8.65	<.001	.81
6. Conflict	3.00	6.40	40.50	9.01	<.001	.84
7. Evasion	3.25	6.50	218.00	8.02	<.001	.75
8. Motivations	3.83	7.00	101.50	8.72	<.001	.82

on the scale. These findings support the construct validity of the scale adaptation, and are also reported in similar adolescent psychometric studies (Canan et al., 2010; Ko et al., 2005). Moreover, for the first time, the PIEUSA provides an assessment tool for adolescents that examines two of the online applications (OVGs and SNSs) that appear specifically predictive of IA (Kuss, Griffiths, & Binder, 2013) in assessing online problem use in British teenagers.

The estimation of problematic Internet users in the UK sample was 5.2%, a rate similar to that found in Spanish high-school students (5%). The same method for extracting the users' categories was applied, although there were differences on the cut-off point scores of the scale in both versions, and in the central tendency index measured in this dependent users (Mdn<sub>British</sub> = 187 vs. Mdn<sub>Spanish</sub> = 162). However, the prevalence of PIU was much lower than almost all other adolescent studies done with scales for this age group that have recorded values at least twice as high; although research suggests that a minority of Internet game players experience addictive symptoms (Kuss & Griffiths, 2012). This is probably because the extraction of cut-off points followed different methods. For instance, Kayri and Gunuc (2010) used cluster analysis, and Tsai and Lin (2001) selected a cut-off score (i.e., individuals with scores greater than 80 were classed as dependents whereas those below 80 were classed as non-dependents). Furthermore, the low prevalence of British problem users estimated in the present study may have possibly been due to the selection of the most rigorous cut-off points (Chow et al., 2009), the inclusion of all the PIU symptoms, and/or because these two PIEUSA studies were performed with European samples (i.e., there may be cultural differences between European and Asian adolescents). For instance, the cross-cultural study of Durkee et al. (2012) found a prevalence of 4.4% in European adolescents. Recently, Kuss, van Rooij, Shorter, Griffiths and van de Mheen (2013) reported 3.7% of Dutch adolescents had problematic online use, whereas Asian studies typically report prevalence rates that at least triple these values, being around 11.7% (Tsai & Lin, 2001) to 18.2% (Ko, Yen, Yen, Lin, & Yang, 2007).

In relation to the problem Internet user profile, although no statistical differences were found in the socio-demographic variables

measured, the profile appears to confirm findings found in other studies. More specifically, problematic online users tend to be young males (Chow et al., 2009; Sargin, 2013), with Internet access at home and living in the metropolitan area (Durkee et al., 2012), accessing Internet almost daily and spending twice as long (Johansson & Götestam, 2004; Kaltiala-Heino, Lintonen, & Rimpelä, 2004) more than two hours (Stavropoulos, Alexandraki, & Motti-Stefanisi, 2013). The perceive that the Internet affects them in different ways, and considering themselves as quite expert in Internet matters as they initiated their Internet use during their childhood (Lopez-Fernandez et al., 2013). However, this last observation does not seem to have had an influence in other studies (Ko et al., 2005). Such data suggest that time dedicated to a typical online session is a better indicator than the weekly frequency, because online time in years and weekly online frequency seem not be useful indicators. This is in line with Griffiths' (2010) case study observations that time spent online are not necessarily associated with problematic and/or addictive online use; similarly, "loss of control" may change its nature over time (Griffiths, 2005, 2013). More attention must be paid to psychological features related with addiction. In this sense, Beard (2011) also pointed out other high-risk psychological characteristics (such as impulsivity, sensation-seeking, self-esteem, and shyness) or psychiatric comorbidity (mood, anxiety, attention-deficit and hyperactivity or substance use disorders, etc.) are in need of further investigation. Psychosocial aspects of teenagers' lives (such as relationships with family and friends, educational context and cultural framework) should also be taken into account (Appel, Holtz, Stiglbauer, & Batinic, 2012; Selfhout, Branje, Delsing, ter Bogt, & Meeus, 2009). Additionally, addiction is a multifaceted behaviour that is strongly influenced by contextual factors; therefore a biopsychosocial approach is highly recommended (Griffiths, 2005).

It is worth noting that using the same method and scale, the British online problematic users in this particular sample tended to present with all the addictive symptoms (Mdn > 7) compared with the Spanish sample that tended to present with less (Mdn > 5). The adapted scale also showed very good sensitivity

and specificity in classifying users with all the symptoms, and the balance between the two was reasonably high. For instance, “loss of control” and “conflict” obtained perfect sensitivity and high specificity.

Interesting results were also observed in relation to the symptomatology. First, following the procedure of frequency of incidence for symptoms for problem users by Tao et al. (2010), different symptoms were found for different age groups (i.e., Adults: “preoccupation” and “withdrawal” vs. Adolescents: “loss of control” and “conflict”), although it should be noted that 100% of problematic Internet users showed at least three addiction-like symptoms. The results obtained in the present study partially agree with those reported by Tao and colleagues, who worked with young adult Chinese clinic sample. Additionally, cultural aspects may have played a role in the differences observed, as other studies have reported (e.g., Ji et al., 2010). Second, the PIEUSA symptoms appeared to more similarly match the main symptoms noted by Lortie and Guitton (2013) – i.e., compulsive use and negative outcomes – rather than the adolescent symptoms assessed in the review by King et al. (2013). This unexpected finding may be due to the fact that King and colleagues only reviewed scales that assessed pathological video-gaming, and the PIEUSA is a more general PIU scale specifically designed to assess adolescent online use based on DSM-IV-TR criteria of addictive syndromes and other IA proposed criteria, similar to questionnaires analyzed by Lortie and Guitton (2013). Third, although a clinical validation along the lines of Ko et al. (2005)’s validation of the adolescent diagnostic criteria of the CIAS is lacking, the present study demonstrated its factorial and construct validation, together with classification accuracy. This clearly highlighted the differences between problem and non-problem users in relation to the complete symptomatology. Fourth, it was observed that – depending on the symptoms – the congruence between sensitivity and specificity may vary. This may, in part, be attributed to the different proportion of items within each symptom. In this regard, future versions of PIEUSA should include an equitable number of items per symptom. However, the classification accuracy of eight candidate symptoms ranged from 82.5% to 94.7%. The scale’s overall accuracy appeared to be close to excellent. Therefore, none of the items were excluded from the analysis in this version of the scale as it accurately measured adolescent PIU symptomatology. Finally, PIEUSA classification criteria almost matched with the IGD criteria recently proposed. However, the PIEUSA also included a ‘social motivation’ criterion not used in other IA scales. As Lortie and Guitton (2013) have pointed out, there is a theoretical and conceptual gap between pathological gambling, substance dependence and EIU, and usually under-represented as a dimension in IA questionnaires. Therefore it has been shown that there is a relationship between the recent APA proposed behavioural addictive disorder (i.e., IGD) and the classification criteria proposed in this adolescent PIU scale (PIEUSA) used in the present study.

From a scale development perspective, there also appears to be some gaps relating to the core addictive symptoms but this is now starting to be addressed (King et al., 2013; Lortie & Guitton, 2013). Through empirical studies, researchers must attempt to determine whether there are core symptoms for IA (Charlton & Danforth, 2007; Charlton & Danforth, 2010) and peripheral ones, depending of several factors, such as the developmental cycles (e.g., adolescent vs. adults), the type of behavioural addiction (e.g., IA vs. pathological video-gaming), and the type of technology (e.g., laptop vs. smartphone, etc.). These future lines of enquiry will hopefully provide further evidence to distinguish more clearly as to what could be considered the differences between EIU and IA.

There were clearly a number of limitations of this cross-sectional and self-report study must be taken into account. The study was performed with a non-random sample and the

questionnaire was administered in the presence of the pupils’ teachers that may have had an effect on some of the results (even though complete anonymity and confidentiality were guaranteed by the research team). However, the study’s strengths include a survey with psychometric and epidemiological techniques, with a considerable sample size, the provision of a British adaptation of the PIEUSA, one of the few validated adolescent scales for IGD, and the light shed on the symptomatology for adolescents in relation to this psychosocial problem of growing importance in contemporary society.

## 5. Conclusions

This present study is the first British epidemiological study examining adolescent IA. This was done by adapting one of the few adolescent generalized PIU scales that supports overall accuracy classification criteria, similar to the IGD recently proposed for further study by the American Psychiatric Association (2013a). The self-reported scale was shown to provide good to excellent reliability and validity, and is an instrument that can estimate prevalence user categories as a measure of IA severity. Furthermore, it is the second version of an instrument that could be used for future cross-cultural research, although clinical validity is still pending as is the case with all other IA tools.

However, more research is needed before IGD can be considered as a diagnostic category in the next DSM. One line of inquiry is to work towards standard diagnostic criteria and to establish a common threshold for a classification (Petty & O’Brien, 2013) or diagnosis with clinical validation. The present findings suggest that they may need to be different for adults and for adolescents. Furthermore, attention must be paid to the course and etiology of the condition, from (core or peripheral) symptoms to contextual factors that explain how EIU transforms into IA. It will be useful in the future to collect data from clinicians and adolescents classified and receiving psychological treatment as problem users to ascertain some of these elements. Finally, further cross-cultural studies are needed (such as that by Durkee et al., 2012) to help to establish a more solid evidence base regarding the psychosocial impact of problematic Internet use in adolescents, and the probable cultural differences that appear to occur between Western and Oriental cultures, among other psychosocial features related with IA.

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