Information and Communications Technologies (ICT): Problematic use of Internet, video games, mobile phones, instant messaging and social networks using MULTICAGE-TIC

Tecnologías de la Información y la Comunicación (TIC): uso problemático de Internet, videojuegos, teléfonos móviles, mensajería instantánea y redes sociales mediante el MULTICAGE-TIC

Eduardo J. Pedrero-Pérez*; José María Ruiz-Sánchez de León**; Gloria Rojo-Mota***; Marcos Llanero-Luque****; Jara Pedrero-Aguilar*; Sara Morales-Alonso*; Carmen Puerta-García*.

* Instituto de Adicciones. Madrid Salud. Madrid City Council; ** Cognitive Deterioration Prevention Centre. Madrid Salud. Madrid City Council. Complutense University of Madrid; *** Instituto de Adicciones. Madrid Salud. Madrid City Council. Rey Juan Carlos University of Madrid; **** Cognitive Deterioration Prevention Centre. Madrid Salud. Madrid City Council.

Abstract

Use/abuse of Information and Communications Technologies (ICT) has in recent years become a topic of great interest. Current discussion addresses whether it must be considered addictive behaviour and if it is a problem that primarily affects adolescents and youth. This study aims to understand the problems that affect people of all ages in controlling the use of these ICTs and whether they are related to mental health problems, stress and difficulties in executive control of behaviour. A survey was administered through social networks and email, using the MULTICAGE-ICT, a questionnaire that explores problems in the use of Internet, mobile phones, video games, instant messaging and social networks. Additionally, the Prefrontal Symptom Inventory, General Health Questionnaire and Perceived Stress Scale were administered. The sample was comprised of 1,276 individuals of all ages from different Spanish-speaking countries. The results indicate that about 50% of the sample, regardless of age or other variables, presents significant problems with the use of these technologies, and that these problems are directly related to symptoms of poor prefrontal functioning, stress and mental health problems. The results reveal the need for reconsidering whether we are facing an addictive behaviour or a new problem demanding environmental, psychological, sociological and sociopolitical explanations; therefore, it is necessary to reformulate actions to be implemented to address and refocus our understanding of the problem.

Keywords: Behavioural addiction; Information and communications technologies; Perceived stress; Dysexecutive syndrome; Mental health.

Resumen

El uso/abuso de las Tecnologías de la Información y la Comunicación (TIC) es un tema que suscita enorme interés en los últimos años. Está en discusión si debe recibir la consideración de conducta adictiva y si es un problema que afecte prioritariamente a adolescentes y jóvenes. El presente estudio pretende conocer los problemas que afectan a las personas de todas las edades en el control del uso de estas TICs y si están relacionados con problemas de salud mental, estrés y dificultades en el control superior del comportamiento. Se realiza una encuesta a través de redes sociales y correo electrónico, en el que se administra el cuestionario MULTICAGE-TIC, que explora problemas en el uso de Internet, teléfono móvil, videojuegos, mensajería instantánea y redes sociales. Adicionalmente se administra el Inventario de Síntomas Prefrontales, el Cuestionario de Salud General y la Escala de Estrés Percibido. Se obtiene una muestra de 1.276 sujetos de todas las edades y diferentes países de habla hispana. Los resultados apuntan a que alrededor del 50% de la muestra presenta importantes problemas en el uso de estas tecnologías, y que esos problemas se relacionan directamente con síntomas de mal funcionamiento prefrontal, estrés y problemas de salud mental, independientemente de la edad u otras variables. Estos resultados sugieren reconsiderar si se trata de una patología adictiva o si estamos ante un problema novedoso que requiere de explicaciones de índole ambiental, psicológica, sociológica y sociopolítica, debiendo reformular las acciones a emprender para reorientar la comprensión y el abordaje del problema.

Palabras clave: adicciones comportamentales; tecnologías de la información y la comunicación; estrés percibido; disfunción ejecutiva; salud mental.

Over the last two decades, the so-called "behavioural addictions" have become increasingly important and have generated ongoing research. For example, a query of the PubMed database using the descriptor "*behavioural addiction*" shows an increase from 304 studies in 1995 to 2,583 in 2014, an uninterrupted exponential growth. Marks (1990) defined the concept of "behavioural addictions" as a group of behaviours characterised by the repeated need for assuming behaviours with known negative consequences, developing behavioural sequences that generate stress and recurrent phases of urgency until they are completed, together comprising a syndrome that is activated by external and internal signals and that ultimately entails difficulty in one's everyday functioning. Over time, concepts have been refined, empirical evidence has been gathered on similarities across behavioural addictions and those related to substances with regards to their natural evolution, phenomenology, tolerance, associated psychopathology, contribution of genetics, neurobiological mechanisms, and response to treatment, among others (Grant, Potenza, Weinstein & Gorelick, 2010).

A significant number of these neuroscientific studies have found that, as occurs with substance addiction, deficits in the functioning of the prefrontal cortex are central elements of behavioural addictions that explain the loss of executive control over problematic behaviour (Blum et al., 2015; Brand, Young & Laier, 2014; de Ruiter, Oosterlaan, Veltman, van den Brink & Goudriaan, 2012) and that important similarities may be found between both modalities in brain structures such as white matter (Yip et al., 2016).

Other studies have focused on finding evidence of the differences among many of these behavioural addictions and those entailing the use of substances. For example, one 5-year longitudinal study (Konkolÿ Thege, Woodin, Hodgins & Williams, 2015) found that the development of these excessive behaviours is usually short-term and that, in most cases, they are abandoned naturally. However, this is not proof of differences, given that most substance addicts also recover spontaneously and without professional assistance (Brevers & Noel, 2015). Some authors denounce that our determination in assimilating excessive repetitive behaviours with criteria for diagnosing psychiatric disorders leads to the assumption of absurd categories that lack specificity and clinical validity and result in overpathologizing everyday life (Billieux, Schimmenti, Khazaal, Maurage & Heeren, 2015), ignore ideographic aspects (Spada, 2015), elude individual differential characteristics (Kardefelt-Winther, 2015) and functionality (Brevers & Noel, 2015), in addition to the behaviours' environmental, social and cultural determinants (Blaszczynski, 2015; Van der Linden, 2015). For these reasons, the concept of behavioural addiction is fiercely questioned (Sinclair, Lochner & Stein, 2016) and, given our actual knowledge, referring to these as compulsive habits seems more appropriate (Potenza, 2015).

The so-called Information and Communications Technologies (ICTs) have been object of the greatest attention. In recent decades, humanity has witnessed two global revolutions of enormous scales. The first, in the final years of the last century, was the popularisation of and unlimited access to the Internet, with the arrival of modems to the home. But, just shortly later, halfway through the first decade of the current century, the second revolution occurred: the transformation of pocket-sized, portable mobile phones into platforms that provide access to an immense number of possibilities.

This emergence of opportunities has entailed great advantages, but also important risks and problems. Based on the concept of Internet addiction (Fernández-Villa et al., 2015; Griffiths, Kuss, Billieux & Pontes, 2016; Young, 2017) or mobile phone addiction (Pedrero-Pérez, Rodríguez-Monje & Ruiz-Sánchez de León, 2012), this study has shifted from supports to specific applications: instant messaging (Dlodlo, 2015; Sultan, 2014), social networks (Schou Andreassen, 2015), online games (Bertran & Chamarro, 2016; Chen & Leung, 2015; Griffiths, 2015), among many others. Studies coincide in finding a relationship between the abuse of some of these modes of online interaction and indicators of poor daily functioning, problems related to self-esteem, and decreased school performance (Grover et al., 2016; Hawi & Samaha, 2016; Ko, Yen, Yen, Chen & Chen, 2012; Schou Andreassen et al., 2016; Soroush, Hancock & Bonns, 2014).

Most of these studies have focused on adolescents or the population of youth under the age of 30, in interpreting that the vulnerabilities that may lead to abuse or addiction become apparent at these ages. However, the penetration of these technologies across all societal levels worldwide allows for hypothesising that all ages may be affected. Scarce evidence supports a relationship between the problems associated with abuse of ICT and psychopathological symptoms or problems in daily activities beyond youth.

The purpose of this study is to detect the frequency of problems associated with use and abuse of Information and Communications Technologies (ICTs) in all age groups and in different geographical and cultural settings. To this end, first the psychometric quality of a previously-used survey was evaluated and adapted to the problems object of the study. Furthermore, given that all of the available models for characterizing behavioural addictions allude to a dysfunctional prefrontal cortex as an antecedent of the loss of executive control over behaviour, we hypothesized a direct relationship between the problematic use of ICTs and the symptoms of prefrontal dysfunction in everyday life, as well as other psychological symptoms and perceived stress.

Eduardo J. Pedrero-Pérez, José María Ruiz-Sánchez de León, Gloria Rojo-Mota,
Marcos Llanero-Luque, Jara Pedrero-Aguilar, Sara Morales-Alonso, Carmen Puerta-García

Method

Participants and procedure

Given that the target population was comprised of frequent users of ICTs, a survey was created using Google Docs® (available at https://goo.gl/4UAyIw) and anonymous and voluntary participation was requested via instant messaging applications (WhatsApp®), social networks (Facebook®) and e-mail. Likewise, the Respondent-Driven Sampling technique was used, requesting participants to disseminate the survey to their contacts. Given that the survey was comprised of 56 items, a minimum of 20 subjects was estimated per item, doubling the usual requirements of the rule of 10 subjects per item (Velicer & Fava, 1998), requiring a minimum of 1,120 subjects. When this figure was reached, a week was given for the study to be completed. Data collection took place between March 8-24, 2016 (n = 1,290). Exploratory data analysis was performed, excluding 14 surveys: 12 had identical responses, 1 was incomplete and 1 was an outlier (all responses reflected the most negative alternative). The final sample was comprised of 1,276 subjects.

Instruments

MULTICAGE-TIC, 20-item survey, comprised of 5 scales, posed questions on problematic use of Internet, Video Games, Mobile Phones, Instant Messaging and Social Networks. It is based on MULTICAGE CAD-4, a survey used for screening compulsive behaviours, with and without substances (Pedrero-Pérez et al., 2007), that has been used in primary care (Garrido-Elustondo, Reneses, Navalón, Martín, Ramos & Fuentes, 2016; Reneses et al., 2015; Rodríguez-Monje, Pedrero-Pérez, Fernández-Girón, Gallardo-Alonso & Sanz-Cuesta, 2009), behavioural addictions (Estevez, Herrero-Fernández, Sarabia & Jauregui, 2015; Estévez Gutiérrez, Herrero Fernández, Sarabia Gonzalvo & Jáuregui Bilbao, 2014) and substance addiction (Navas, Torres, Cándido & Perales, 2014; Martínez-González, Munera-Ramos & Becoña-Iglesias, 2013; Pedrero-Pérez, 2010). This new version's design comprised four questions with dichotomous answers (Yes/No) for each problematic behaviour, asking about: item 1, estimated excessive time dedication; item 2, excessive time estimated by significant others; item 3, difficulty in refraining from the behaviour; item 4, difficulties in voluntarily interrupting the behaviour. Given the newness of the survey, its psychometric properties were tested with the sample itself.

Prefrontal Symptoms Inventory, screening version (ISP-20; Pedrero-Pérez, Ruiz-Sánchez de León, Morales-Alonso, Pedrero-Aguilar & Fernández-Méndez, 2015c) that explores symptoms of malfunction in daily life related with neuropsychological alterations attributable to the prefrontal cortex. Responses are given on a Likert scale (0: never or almost never; 1: sometimes; 2: sometimes yes and sometimes no; 3: frequently; 4: always or almost always).

Factorial analysis found a three-factor solution: problems in behavioural control, problems in emotional control and problems in social behaviour. Validation for the general population and for addicts in treatment reported sufficient internal consistency of all of the subscales ($0.87 < a_s < 0.89$), clinical validity (Ruiz-Sánchez de León, Pedrero-Pérez, Gálvez, Fernández-Méndez & Lozoya-Delgado, 2015), ecological validity (Pedrero-Pérez et al., 2016) and transcultural validity (Cuello Prato & Mendoza Carmona, 2014; González Roscigno, Mujica Díaz, Terán Mendoza, Guerrero Alcedo & Arroyo Alvarado, 2016). In the study sample, multivariate consistency was $\alpha_s = 0.91$ for the complete test and $0.81 < \alpha_s < 0.90$ for the scales.

General Health Questionnaire, 12-item version (*General Health Questionnaire*, GHQ-12; Goldberg & Williams, 1998), Spanish version (Rocha, Pérez, Rodríguez-Sanz, Borrell & Obiols, 2011) is a self-administered screening instrument used to detect indicators of mental illness and possible cases of psychopathological disorders in primary care contexts or in the general population. Responses are given on a four-option Likert scale. It may be corrected in several ways; the following two were adopted for this study: GHQ-Likert, scores between 0 and 3, where higher scores correspond with worse health indicators; and GHQ criterion-referenced scores, assigning the values 0, 0, 1, 1 to item responses. In the study sample, the consistency of the test was $\alpha_s = 0.90$.

The "Escala de Estrés Percibido" (EEP), the Spanish version (Remor & Carrobles, 2001) of the Perceived Stress Scale (PSS) by Cohen, Kamarck & Mermelstein (1983). The complete PSS is comprised of 14 items that measure the degree to which, in the last month, persons have felt unsure or concerned about, or to the contrary have felt certain about, their capacity for controlling their personal problems. A brief, 4-item version is also available, with adequate psychometric properties in the Spanish population, with an internal consistency of $\alpha = 0.83$ in the general population and clinical samples (Pedrero-Pérez et al., 2015b). Responses are given on a 5-item Likert scale, ranging from 0 ("Never") to 4 ("Very frequently"), with scores of between 0-16 and with higher scores corresponding to higher perceived stress. This study used the 4-item version (PSS-4), with an internal consistency of $\alpha_s = 0.81$.

Participants were also asked to specify their age, level of studies, gender, country of birth and actual country of residence.

Data analysis

First, the psychometric properties of MULTICAGE-TIC were analysed. Initially, the distributions for each item were obtained and whether these were distributed in line with the multivariate normality criteria of Mardia (1970). Given that this property was not guaranteed, the tetrachoric correlations matrix was used, and the ω= McDonald's

Omega and α_s= standardized Cronbach's Alfa were used as internal consistency estimates, according to the most recent recommendations (Dunn, Baguley & Brunsden, 2014). The FACTOR 10.3.01 program (Lorenzo-Seva & Ferrando, 2006) was used for these tests. Then, a confirmatory factorial analysis was performed of the theoretical proposal of 5 scales for the data obtained, and the unweighted least squares (ULS) method was used, with indicators of fit provided by the AMOS 18 application (RMR = Root Mean Square Residual, with acceptable values below 0.06; GFI = General Fit Index; AGFI = Adjusted Goodness of Fit Index; NFI = Normed Fit Index; RFI = Relative Fit Index, all with acceptable values above 0.90; PNFI = Parsimonious Normed Fit Index and PGFI = Parsimony Goodness of Fit Index, both acceptable with values above 0.7). Partial correlation tests were performed, controlling for covariables, and using the Bonferroni correction for multiple correlations to avoid committing a type 1 error. Stepwise linear

regression was done using the Durbin-Watson test to control for prediction errors. MANCOVA was performed to compare subgroups, using the partial eta-squared (η^2) to estimate the effect size and the "rules of thumb" proposed by Cohen (1988): 0.01 small effect size, 0.06 medium effect size and 0.14 large effect size. For these analyses, gender was the dummy variable, with values 0 and 1. Analyses was performed using the SPSS 19 statistics package.

Results

Characteristics of the sample

Table 1 displays the complete sample's descriptive variables.

Psychometric properties of MULTICAGE-TIC

Table 2 displays the descriptive variables for the MULTICAGE-TIC items, in addition to each scale's Goodness of Fit Index (GFI) and internal consistency measures. All scales have adequate internal consistency, though lower, yet still acceptable (> 0.70) for the Mobile Telephone scale, at the expense of low communality of the third item ("*On a day that you don't have your mobile phone with you, do you feel uneasy or as if something very important is missing?*") with the scale's remaining items.

The model was tested as a whole, with confirmatory factorial analysis to verify the fit of the 5-scale theoretical

Table 1. *Descriptive variables of the sample.*

	Country of origin		Residence
	n	%	Country of origin (%)
Spain	960	75.2	97.8
Colombia	138	10.8	86.2
Venezuela	94	7.4	89.4
Other countries			
Europe	27	2.1	0
North America	2	0.2	0
Other countries of Latin America	48	3.8	60.4
Asia	3	0.2	0
Africa	4	0.3	0
Gender			
Males	425	33.3	
Females	851	66.7	
Level of studies			
Primary or lower	28	2.2	
Secondary	65	5.1	
Higher secondary	176	13.8	
University student	193	15.1	
University graduate	814	63.8	
Age			
‹ 18	57	4.5	
18 - 25	272	21.3	
25 - 30	129	10.1	
30-45	393	30.8	
45 - 60	365	28.6	
› 60	60	4.7	
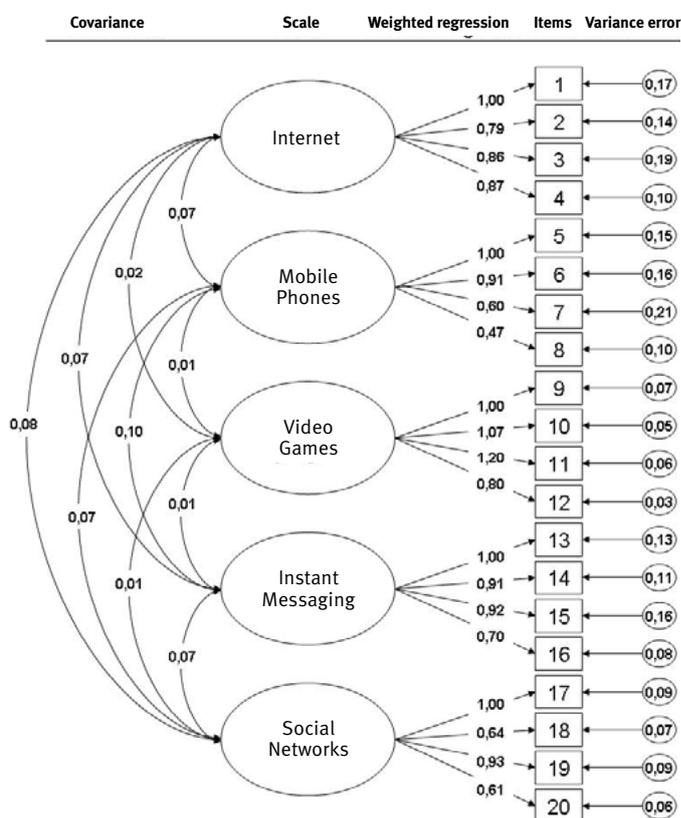
Figure 1. MULTICAGE-TIC structural model.

Eduardo J. Pedrero-Pérez, José María Ruiz-Sánchez de León, Gloria Rojo-Mota,
Marcos Llanero-Luque, Jara Pedrero-Aguilar, Sara Morales-Alonso, Carmen Puerta-García

Table 2. Descriptive variables and indicators of fit and internal consistency of the MULTICAGE-TIC scales.

Scale	Item	Median	Mean	95% confidence interval	Variance	Asymmetry	Kurtosis	Communa-lities	r_{it}	GFI	ω	$α_s$
Internet	1	1	0.51	(0.48 - 0.55)	0.25	-0.04	-2.00	0.62	0.45			
	2	0	0.26	(0.23 - 0.29)	0.19	1.11	-0.76	0.43	0.38			
	3	1	0.51	(0.47 - 0.54)	0.25	-0.02	-2.00	0.35	0.36	0.99	0.81	0.80
	4	0	0.21	(0.18 - 0.24)	0.16	1.45	0.11	0.68	0.46			
Mobile Phone	1	1	0.60	(0.57 - 0.64)	0.24	-0.42	-1.82	0.72	0.41			
	2	0	0.38	(0.34 - 0.41)	0.23	0.52	-1.73	0.50	0.38			
	3	0	0.64	(0.60 - 0.67)	0.23	-0.56	-1.68	0.11	0.21	1.00	0.74	0.72
	4	0	0.15	(0.13 - 0.18)	0.13	1.93	-1.73	0.43	0.30			
Video Games	1	0	0.12	(0.10 - 0.14)	0.11	2.34	3.48	0.75	0.56			
	2	0	0.10	(0.08 - 0.12)	0.09	2.62	4.86	0.76	0.57			
	3	0	0.13	(0.11 - 0.15)	0.11	2.21	2.89	0.60	0.46	1.00	0.91	0.90
	4	0	0.05	(0.03 - 0.06)	0.05	4.16	15.32	0.71	0.49			
Instant Messaging	1	0	0.41	(0.37 - 0.44)	0.24	0.38	-1.86	0.77	0.60			
	2	0	0.29	(0.26 - 0.32)	0.21	0.94	-1.13	0.65	0.56			
	3	0	0.51	(0.48 - 0.55)	0.25	-0.05	-2.00	0.58	0.49	1.00	0.89	0.89
	4	0	0.17	(0.14 - 0.19)	0.14	1.80	1.22	0.71	0.49			
Social Networks	1	0	0.31	(0.27 - 0.34)	0.21	0.83	-1.31	0.92	0.68			
	2	0	0.14	0.12 - 0.17)	0.12	2.03	2.11	0.68	0.55			
	3	0	0.27	(0.24 - 0.31)	0.20	1.02	-0.97	0.81	0.66	1.00	0.93	0.93
	4	0	0.13	(0.10 - 0.15)	0.11	2.26	3.12	0.71	0.54			

Note. r_{it}= corrected item-test correlation; GFI = Goodness of Fit Index; ω= McDonald's Omega; $α_s$= standardised Cronbach's Alpha..

Table 3. Affirmative responses for each item of the MULTICAGE-TIC and the percentage of subjects with affirmative responses to a given number of questions.

	Affirmative responses (%) Item				% Affirmative responses for all items			
Scale	1	2	3	4	0-1	2	3	4
Internet	51.1	25.7	50.5	20.6	51.1	25.7	50.5	20.6
Mobile Phone	60.3	37.5	63.6	15.3	60.3	37.5	63.6	15.3
Video Games	12.0	10.3	12.9	4.9	12.0	10.3	12.9	4.9
Instant Messaging	40.8	28.8	51.3	16.6	40.8	28.8	51.3	16.6
Social Networks	30.8	14.4	27.4	12.5	30.8	14.4	27.4	12.5

model to the data obtained. None of the surveys met multivariate normality criteria (Mardia p < 0.05 in all cases). Therefore, the unweighted least squares (ULS) method was used. Indicators of fit were satisfactory (RMR = 0.012; GFI = 0.96; AGFI = 0.95; NFI = 0.94; RFI = 0.92; PGFI = 0.73; PNFI = 0.79) and the third item of the Mobile Phone scale would just slight improve the model's fit (RMR = 0.011; GFI = 0.97; AGFI = 0.96; NFI = 0.94; the others remain unchanged). Figure 1 shows the resulting structural model.

Table 3 displays the percentage of affirmative response for each item and the percentage of subjects with affirmative responses to a given number of questions. While for Video Games only 10.9% respond affirmatively to 2 or more

items, the percentage increases to 45.1% for the Internet and 57.5% for Mobile Phones.

Table 4 shows that the ISP, whether as a whole or by subscales, correlates with all of the MULTICAGE-TIC scales, once implementing corrections to avoid type 1 error (Bonferroni) and controlling for age, gender and level of studies. The effect size is small or medium in all cases ($0.06 < r^2 < 0.01$). The case is the same for the GHQ ($0.04 < r^2 < 0.01$), while with the PSS it only occurs in relation to three scales ($0.02 < r^2 < 0.01$), but not with the other two ($r^2 < 0.01$).

Table 5 displays the results of joint regression of the items of the ISP-20, GHQ-12 and PSS-4, marking those with predictive capacity ($R^2 * 100 > 1$) for MULTICAGE-TIC sca-

Table 4. *Partial correlations (controlling for gender, age and level of studies) between the MULTICAGE-TIC and the ISP-20, GHQ-12
and EEP questionnaires.*

	Internet	Mobile Phone	Video Games	Instant Messaging	Social Networks
ISP-20	0.24*	0.17*	0.17*	0.22*	0.19*
Executive problems	0.22*	0.15*	0.16*	0.19*	0.18*
Social Behaviour Problems	0.16*	0.11*	0.13*	0.18*	0.13*
Emotional Control Problems	0.16*	0.13*	0.08	0.15*	0.13*
GHQ-12					
Likert Scores	0.19*	0.09	0.12*	0.14*	0.12*
Criterion-referenced score	0.19*	0.12*	0.13*	0.17*	0.14*
EEP-4					
Perceived Stress	0.15*	0.09	0.09	0.15*	0.11*

Note. *Significant correlation after applying the Bonferroni correction for multiple correlations.
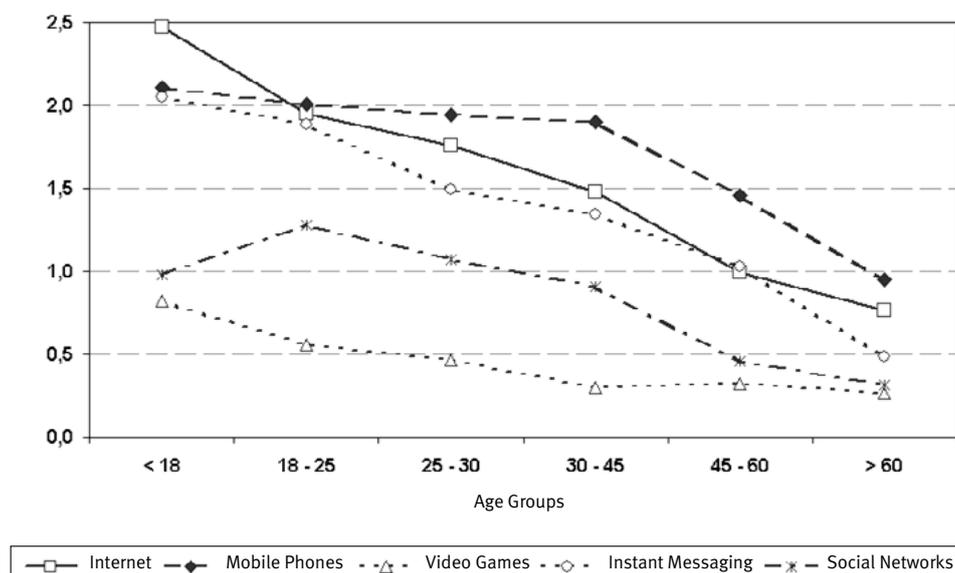
Figure 2. Average scores in the MULTICAGE-TIC scales by age groups.

les. Problems with concentration, difficulties with emotional control, motivational deficits and disinhibited social behaviour are the problems most-related with the different scales on the use of ICTs, though it cannot be determined whether they cause, or result of, problematic use.

When subjects are categorized according to the number of affirmative responses to the MULTICAGE-TIC scales, it is observed (Table 6) that the prefrontal symptoms increase almost in parallel, somewhat similar to what occurs with the scores in the GHQ and the PSS.

Figure 2 shows the average scores by age groups. The highest scores are obtained by the youngest age groups (except for the Social Networks scale, which peaks between the ages of 18-25), showing a gradual decrease, except for Mobile Phones, in which similar levels are maintained until the age of 45.

Gender differences

Table 7 displays the average scores and dispersion of the estimated variables by surveys and gender. Significant differences are found for all variables, with low to moderate effect sizes. Females obtain higher scores in the scales on the use of Mobile Phones, Instant Messaging, and Social Networks, while males obtain higher scores in the use of the Internet and Video Games. Females also obtain higher scores in prefrontal symptoms (though only at the expense of declaring more symptoms related with poor emotional control), risk of poor mental health and perceived stress.

Eduardo J. Pedrero-Pérez, José María Ruiz-Sánchez de León, Gloria Rojo-Mota,
Marcos Llanero-Luque, Jara Pedrero-Aguilar, Sara Morales-Alonso, Carmen Puerta-García

Table 5. *Items with predictive capacity ($R^2*100 > 1$) of the items of the ISP-20, GHQ-12 and EEP-4 for the MULTICAGE-TIC scales.*

Items	Internet	Mobile Phone	Video Games	Instant Messaging	Social Networks
It is difficult for me to concentrate on anything	6.5	1.0		1.0	
Have you been able to concentrate well on your activities over the last few weeks?					1.0
Have you constantly felt overwhelmed and stressed?					1.0
I laugh or cry too easily	1.0	3.0		2.2	1.4
Many times I am incapable of doing things unless someone tells me I must do them	2.0	1.9	1.8		3.9
I forget that there are things I must do but I remember when reminded			1.0		
I feel lethargic, sleepy				4.1	
I make very personal comments in front of others				1.2	
I make inappropriate sexual comments	1.2				
I tell unsuitable jokes in inappropriate situations			3.0		

Table 6. *Scores on prefrontal symptoms, mental health and perceived stress according to the number of affirmative responses in each scale of MULTICAGE-TIC (controlling for gender, age and level of studies).*

MULTICAGE-TIC			Number of affirmative responses					F_7	η^2
			0	1	2	3	4		
Internet	ISP-20	M	14.65	15.84	19.57	21.47	24.63	25.21*	0.12
		SD	9.327	10.28	10.64	10.42	12.59		
	GHQ-12	M	9.25	10.21	10.39	11.81	12.96	10.78*	0.06
		SD	4.25	4.49	4.95	5.90	6.89		
	EEP-4	M	4.15	4.59	5.16	5.86	6.18	17.34*	0.09
		SD	3.05	2.88	3.19	3.24	3.29		
Mobile Phone	ISP-20	M	14.63	16.98	17.57	19.91	23.81	20.31*	0.10
		SD	9.76	10.26	10.36	10.94	12.75		
	GHQ-12	M	9.81	10.22	10.02	11.15	12.24	6.06*	0.03
		SD	4.62	4.58	5.06	5.55	6.15		
	EEP-4	M	4.13	4.82	4.78	5.57	5.63	15.05*	0.08
		SD	3.08	3.13	3.09	3.12	3.36		
Video Games	ISP-20	M	16.90	19.28	22.04	25.85	23.87	18.85*	0.09
		SD	10.52	9.81	11.38	10.77	15.06		
	GHQ-12	M	10.12	10.94	11.55	13.39	11.88	6.15*	0.03
		SD	4.88	5.25	5.62	6.19	7.30		
	EEP-4	M	4.72	5.26	5.74	6.41	5.38	15.54*	0.07
		SD	3.10	2.96	3.68	3.36	2.79		
Instant Messaging	ISP-20	M	15.15	17.23	17.85	21.64	24.05	23.84*	0.12
		SD	9.83	10.67	10.06	10.46	12.04		
	GHQ-12	M	9.73	10.21	10.08	11.62	12.40	7.59*	0.04
		SD	4.37	4.94	4.96	5.86	6.31		
	EEP-4	M	4.27	4.80	4.89	5.73	6.22	17.60*	0.09
		SD	3.02	3.12	2.97	3.31	3.12		
Social Networks	ISP-20	M	16.22	18.94	18.70	21.83	25.26	21.26*	0.11
		SD	10.30	10.80	9.51	10.79	12.97		
	GHQ-12	M	9.93	10.79	10.89	11.35	12.60	6.11*	0.03
		SD	4.48	5.67	5.16	6.19	6.91		
	EEP-4	M	4.57	5.08	5.11	5.89	6.15	15.33*	0.08
		SD	3.05	3.23	2.96	3.37	3.47		

Note. M= Mean; SD = Standard Deviation; * $p < 0.001$; η^2= Partial eta-squared for estimating the effect size.

Table 7. *Gender differences in the different scales (controlling for age and level of studies).*

MULTICAGE-TIC	Males		Females			
	M	SD	Females	SD	F_3	η^2
Internet	1.55	1.25	1.44	1.28	55.74*	0.12
Mobile Phone	1.60	1.19	1.85	1.16	26.08*	0.06
Video Games	0.53	1.03	0.34	0.79	15.41*	0.04
Instant Messaging	1.06	1.24	1.53	1.40	49.77*	0.11
Social Networks	0.71	1.15	0.92	1.31	26.69*	0.06
ISP-20	17.51	11.01	18.08	10.68	30.69*	0.07
Executive problems	11.63	7.89	11.49	7.38	18.69*	0.04
Social Behaviour Problems	2.50	2.77	1.68	2.11	24.99*	0.06
Emotional Control Problems	3.37	2.82	4.90	3.25	59.17*	0.12
GHQ-12						
Likert Scores	10.11	4.75	10.60	5.27	7.34*	0.02
Criterion-referenced score	1.46	2.41	1.77	2.76	16.95*	0.04
EEP-4						
Perceived Stress	4.66	3.02	5.03	3.22	29.91*	0.07

Note. NOTE: M= Mean; SD = Standard Deviation; * p < 0.001; η^2= Partial eta-squared for estimating the effect size.

Geographical differences

To study geographical differences, subjects that resided in their country of origin were selected and the three sufficiently numerous populations were compared (Spain, Colombia and Venezuela). Table 8 shows that Venezuelans obtained higher scores in the scales on the use of ICTs and prefrontal symptoms, but not in those of poor mental health and perceived stress. The Colombian sample assumed an intermediate position, except for perceived stress, which was lower compared with the other two samples.

Discussion

The purpose of this study was to detect the frequency of problems associated with the use and abuse of Information and Communications Technologies (ICTs) in all age groups and in different geographical and cultural settings. To this end, it was necessary, first, to find evidence of validity of the survey to be used in exploring these issues. The MULTICAGE-TIC has shown adequate internal consistency and evidence of validity. Only item 3 ("*On a day that you don't have your mobile phone with you, do you feel uneasy or as if something very important is missing?*") of the Mobile Phone scale showed low communality with the other three. It is possible that, in the case of Mobile Phones, unavailability fails to have a relationship with the remaining problems explored by the scale. This is probable because, in today's society, doing without a mobile phone in everyday life entails a notable loss, even when someone makes adequate use of the device. Someone may forego playing video games, chatting or checking their social networks, but the mobile phone offers infinite additional functions that may have transformed it into an indispensable object in our everyday activities. A recent report by Telefónica provides data on the increasing importance of the smartphone in everyday life of the Spanish population, which checks it an average of 150 times per day, reflecting an unstoppable trend: it is increasingly difficult for us to live without a smartphone (Telefónica, 2015).

Second, the results show high percentages of people who experiment difficulties with the use of these devices and resources. MULTICAGE was initially based on CAGE (Ewing, 1984), the validation studies of which established that affirmative responses to 2, 3 or 4 items corresponded with hazardous drinkers, harmful use of alcohol and alcohol dependency, respectively. However, for ICTs, no classification criteria are available for determining the item content, nor universally established gold standard tests for determining cut-off scores. If we assume, even provisionally, CAGE scores, the results would be as follows: 57.5% of survey participants obtained scores in problematic use of Mobile Phones (7.9% dependency), 45.1% in problematic use of the Internet (8.6% dependency), 39% in problematic use of Instant Messaging (10.7% dependency), 25.3% in problematic use of Social Networks (6.1% dependency) and 10.9% in problematic use of Video Games (1.9% dependency). Furthermore, though these percentages achieve their peak in subjects under the age of 18, they remain

Eduardo J. Pedrero-Pérez, José María Ruiz-Sánchez de León, Gloria Rojo-Mota,
Marcos Llanero-Luque, Jara Pedrero-Aguilar, Sara Morales-Alonso, Carmen Puerta-García

Table 8. *Differences by geographic location (controlling for age and level of studies).*

	Spain (n = 939)		Colombia (n = 119)		Venezuela (n = 84)			
	M	SD	M	SD	M	SD	F_4	η^2
MULTICAGE-TIC								
Internet	1.38	1.23	1.41	1.26	2.00	1.40	42.84*	0.13
Mobile Phone	1.69	1.13	1.78	1.33	2.50	1.12	23.80*	0.08
Video Games	0.36	0.81	0.41	1.01	0.77	1.21	12.95*	0.04
Instant Messaging	1.30	1.32	1.45	1.49	2.21	1.34	40.76*	0.13
Social Networks	0.67	1.13	1.18	1.44	1.63	1.47	32.78*	0.10
ISP-20	17.61	10.47	17.20	12.01	19.42	10.51	17.35*	0.06
Executive problems	11.32	7.33	11.17	8.26	12.15	7.15	11.25*	0.04
Social Behaviour Problems	1.94	2.28	1.78	2.53	2.18	2.76	13.29*	0.04
Emotional Control Problems	4.35	3.15	4.25	3.12	5.08	3.44	31.11*	0.10
GHQ-12								
Likert Scores	10.62	4.86	9.15	6.14	9.07	5.00	7.75*	0.03
Criterion-referenced score	1.61	2.66	1.66	2.66	1.63	2.07	10.78*	0.04
EEP-4								
Perceived Stress	5.01	3.10	3.76	3.23	5.02	3.09	23.70*	0.08

Note. M= Mean; SD = Standard Deviation; * p < 0.001; η2= Partial eta-squared for estimating the effect size.

quite stable, though with a continued decline, through successive age groups, and are higher in university students. Even if the responses necessary for considering problematic use or dependency are limited to 3 or 4, problematic use would still be the case in 27.7% of the subjects with Mobile Phones, 22.7% with the Internet and 24% with Instant Messaging.

Dispersed percentages also predominate in previous studies. According to the criteria and instruments applied, a review found that prevalence of addiction to the Mobile Phone varied between 0 and 38% (Pedrero-Pérez, Rodríguez-Monje & Ruiz-Sánchez de León, 2012) and that addiction to the Internet varied between 0.8% and 18.8% (Pontes, Kuss & Griffiths, 2015). Results are insufficient as regards the use of Social Networks and Instant Messaging.

It may be argued that this study sample was comprised of subjects who were already users of these devices and applications, and was not extracted from the general population. In addition, most prior studies were completed using convenience samples, usually university students or adolescents, and applied a wide range of instruments and diagnostic criteria (Pedrero et al., 2012; Pontes et al., 2015). Furthermore, according to studies of the National Statistics Institute, 74.4% of Spanish households are connected to the Internet, 76.2% of the population uses the Internet, 77.1% access the web via Mobile Phone, and 51.1% use Social Networks. The most striking fact is that the percentage of Internet users rose almost five points in just one year, compared with 2013. Therefore, this study

overcomes some of the limitations of previous studies in relation to sample size and participant variability.

Another of this study's goals was to explore the relationship between problematic use and psychopathological variables. The results reveal a positive, linear relationship between problematic use of all devices or resources explored and symptoms of prefrontal dysfunction in everyday life, risk of poor mental health and perceived stress. This relationship is consistent and highly significant, despite a low to moderate effect size. In other words: people with difficulties in managing their relationship with ICTs show difficulties in managing their everyday activities, not only those related with ICTs. What others prefer to interpret as evidence of pathology remains a redundant argument. The task of managing ICTs involves personal characteristics, like personality (Wilmer & Chein, 2016), and personality traits are strongly supported by prefrontal lobe functioning (Pedrero-Pérez, Ruiz-Sánchez de León & Llanero Luque, 2015a; Pedrero-Pérez et al., 2013). The data also raises another question, though it remains unanswered, given the study's methodology: does prefrontal dysfunction precede difficulties with ICTs and, therefore, represents a vulnerability, or does it result of excessive immersion in these types of devices or applications, negatively impacting everyday life?

Results suggest that males and females very frequently have problems with controlling their use of these devices and resources, but with some differences: males obtain higher scores on the Internet and Video Game scales, whi-

le females do so in the Mobile Phone, Instant Messaging and Social Networks scales. The effect size for Internet and Instant Messaging is quite considerable and points to solid differences which may be associated with different levels of use and problems with controlling use. Males declared more prefrontal symptoms in general, but females score higher in problems related with Emotional Control. These differences are common in all studies; likewise, it is normal for females to score higher in symptoms of mental illness and perceived stress (Davis, Matthews & Twamley, 1999). Gender differences in the completion of self-reports must always be kept in mind to refrain from generating erroneous interpretations.

There are also differences in the participants' place of origin. An analysis was performed of three samples with a sufficient number of subjects, born in and residents of three different countries. Though we have already alluded to individual differences in ICT management styles, it is also necessary to point out that different sociocultural backgrounds entail, without a doubt, another notable source of variability.

When we study the predictive capacity of the items of the MULTICAGE scale scores, we find that four groups of items have this capacity: those referring to problems with maintaining attention, those referring to emotional instability, those alluding to motivational problems, and those reflecting lack of control as regards disinhibited social behaviour. As is the case with the remaining results, a dual explanation is possible: that these problems favour lack of control, or that these result of excessive immersion in these resources. For example, it is worth questioning whether problems with concentrating favour the problematic use of the Internet, or if this difficulty in concentrating in one's everyday life results of excessive browsing of the Web. In any case, the fact that just one item has the capacity for predicting 6.5% of a scale's total variance is grounds for developing new hypotheses and lines of research.

All of these data require reflection. While the psychiatric perspective tends to include substanceless addictions in diagnostic classifications (this has already been achieved for Gaming in the recent DSM-5), create new terms associated with the abuse of ICTs (*nomophobia, phubbing, vibranxiety, FoMO*) and pathologise any excess, other trends warn of the absurdity of this procedure, the effect of which is the overpathologication of everyday life (see Billieux et al., 2015 and all of the following commentaries in the same Journal number). In fact, many authors advocate for studying other issues, like the functionality of these technologies in the lives of individuals and groups, the socioeconomic and sociopolitical conditions that favour new uses and new problems, the improvements these contribute to everyday life and the pressures that may lead to an excessive use of these technologies or to feeling coerced to decrease their use. When a "problem" affects 50% of the

population, or even merely 25%, considering it "psychopathological" may seem hardly adequate, and much less referring to "social pathology" of "epidemic" proportions, terms customarily used in mass media but that lack scientific relevance. It is probably necessary to accelerate the paradigm shift suggested by some authors, abandoning the trend toward the psychiatrisation of any occurrence and refocusing research on environmental elements that foster new behaviours (Pemberton & Wainwright, 2014), urgently demanded since years ago in the field of addictions specifically (Deacon & McKay, 2015; Hall, Carter & Forlini, 2015). As occurs in substance addiction, the first focus is expected to accumulate evidence of "comorbidity" and "dual diagnosis", which contributes little or nothing to our understanding and problem-solving (Seo, Kim & David, 2015), while the second focus may serve to understand excessive behaviours from an evolutionary perspective, and contributes educational and therapeutic elements (Kwan & Leung, 2015).

This study's main limitation refers to the method used for obtaining the sample. Dissemination using social networks does not allow for controlling the quality of participation, the participants' motivation, nor, of course, for generalizing results. The only way to control, at least globally, the quality of the responses, is to obtain a sufficiently large sample so that the percentage of inadequate responses will lose specific weight in the global results. For this purpose, a minimum value of 20 participants/item was estimated, doubling the strictest requirements in similar studies (Velicer & Fava, 1998). Nevertheless, the Respondent-Driven Sampling technique is recommendable when it is difficult to access the target population, or when large sample sizes are desired. Like all sampling methods, it entails risks that must be considered (Bowling, 2005). Internal consistency of tests, on both item and scale levels, is the main evidence that the data has been adequately obtained, at least for the most part.

In summary, the data of this study report the high frequency of problems associated with excessive use and immersion in the so-called Information and Communications Technologies (ICTs), a fact that is generalised across different countries, both genders, and all ages and cultural levels. This excessive use is related to difficulties in controlling behaviours, emotions and socializing in everyday activities, as well as to risk symptoms for developing mental health problems and for experimenting higher stress levels. Future studies should explore the directionality of these relationships to determine whether they are vulnerabilities for or consequences of abuse, or if both probabilities reinforce one another. Classifying these excessive behaviours as mental disorders will hardly favour understanding them and most likely will extend the borders of the psychiatric diagnosis to a disproportionate percentage of the population, which, no doubt, is an unacceptable ex-

cess and entails important consequences (pathologisation of everyday life, expansion of pharmacological treatments, etc.). Studies are needed that consider environmental circumstances (sociological, political, economic, ethical), individual predisposition (personality, social values, goals) and the interaction between both elements to understand what was originally a revolution in human communications and has evolved much faster than the scientific knowledge available for explanatory and predictive purposes.

Conflict of interests

The authors declare the inexistence of conflicts of interest.

References

Bertran, E. & Chamarro, A. (2016). Videojugadores del League of Legends: El papel de la pasión en el uso abusivo y en el rendimiento. *Adicciones, 28*, 28-34. doi:10.20882/adicciones.787.

Billieux, J., Schimmenti, A., Khazaal, Y., Maurage, P. & Heeren, A. (2015). Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *Journal of Behavioral Addictions, 4*, 119-123. doi:10.1556/2006.4.2015.009.

Blaszczynski, A. (2015). Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *Journal of Behavioral Addictions, 4*, 142-144. doi: 10.1556/2006.4.2015.016.

Blum, K., Febo, M., Smith, D. E., Roy III, A. K., Demetrovics, Z., Cronjé, F. J., ... Badgaiyan, R. D. (2015). Neurogenetic and epigenetic correlates of adolescent predisposition to and risk for addictive behaviors as a function of prefrontal cortex dysregulation. *Journal of Child and Adolescent Psychopharmacology, 25*, 286-292. doi:10.1089/cap.2014.0146.

Bowling, A. (2005). Mode of questionnaire administration can have serious effects on data quality. *Journal of Public Health, 27*, 281-291. doi:10.1093/pubmed/fdi031.

Brand, M., Young, K. S. & Laier, C. (2014). Prefrontal control and Internet addiction: a theoretical model and review of neuropsychological and neuroimaging findings. *Frontiers in Human Neuroscience, 8*, 375. doi:10.3389/fnhum.2014.00375.

Brevers, D. & Noel, X. (2015). Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. On functional and compulsive aspects of reinforcement pathologies. *Journal of Behavioral Addictions, 4*, 135-138. doi: 10.1556/2006.4.2015.017.

Chen, C. & Leung, L. (2015). Are you addicted to Candy Crush Saga? An exploratory study linking psychological factors to mobile social game addiction. *Telematics and Informatics, 33*, 1155–1166. doi:10.1016/j.tele.2015.11.005.

Cohen, J. (1988). *Statistical power analysis for the behavioral scienc*es (2ª ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Cohen, S., Kamarck, T. & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*, 385-396.

Cuello Prato, P. V., y Mendoza Carmona, Y. L. (2014). *Análisis psicométrico del inventario de sintomatología prefrontal (ISP) en sujetos adictos y no adictos.* Barquisimeto: Universidad Centroccidental Lisandro Alvarado.

Davis, M. C., Matthews, K. A. & Twamley, E. W. (1999). Is life more difficult on Mars or Venus? A meta-analytic review of sex differences in major and minor life events. *Annals of Behavioral Medicine, 21*, 83-97. doi:10.1007/BF02895038.

Deacon, B. J. & McKay, D. (2015). The biomedical model of psychological problems: A call for critical dialogue. *The Behavior Therapist, 38*, 231-235.

Dunn, T. J., Baguley, T. & Brunsden, V. (2014). From alpha to omega: A practical solution to the pervasive problem of internal consistency estimation. *British Journal of Psychology, 105*, 399-412. doi:10.1111/bjop.12046.

de Ruiter, M. B., Oosterlaan, J., Veltman, D. J., van den Brink, W. & Goudriaan, A. E. (2012). Similar hyporesponsiveness of the dorsomedial prefrontal cortex in problem gamblers and heavy smokers during an inhibitory control task. *Drug and Alcohol Dependence, 121*, 81-89. doi:10.1016/j.drugalcdep.2011.08.010.

Dlodlo, N. (2015). Salient indicators of mobile instant messaging addiction with selected socio-demographic attributes among tertiary students in South Africa. *South African Journal of Psychology, 45,* 207-222. doi:10.1177/0081246314566022.

Estevez, A., Herrero-Fernández, D., Sarabia, I. & Jauregui, P. (2015). The impulsivity and sensation-seeking mediators of the psychological consequences of pathological gambling in adolescence. *Journal of Gambling Studies, 31*, 91-103. doi:10.1007/s10899-013-9419-0.

Estévez Gutiérrez, A., Herrero Fernández, D., Sarabia Gonzalvo, I. & Jáuregui Bilbao, P. (2014). El papel mediador de la regulación emocional entre el juego patológico, uso abusivo de Internet y videojuegos y la sintomatología disfuncional en jóvenes y adolescentes. *Adicciones, 26*, 282-290.

Ewing, J. A. (1984). Detecting alcoholism. The CAGE questionnaire. *JAMA, 252*, 1905-1907. doi:10.1001/jama.1984.03350140051025.

Fernández-Villa, T., Alguach Ojeda, J., Almaraz Gómez, A., Cancela Carral, J.M., Delgado-Rodríguez. M., García-Martín, M.,... Martín, V. (2015). Uso problemático de internet en estudiantes universitarios: factores asociados y diferencias de género. *Adicciones, 27*, 265-275.

Garrido-Elustondo, S., Reneses, B., Navalón, A., Martín, O., Ramos, I. & Fuentes, M. (2016). Capacidad de de-

tección de patología psiquiátrica por el médico de familia. *Atención Primaria, 48,* 449-457. doi:10.1016/j. aprim.2015.09.009.

González Roscigno, E. A., Mujica Díaz, A. L., Terán Mendoza, O. E., Guerrero Alcedo, J. M. & Arroyo Alvarado, D. J. (2016). Sintomatología frontal y trastornos de personalidad en usuarios de drogas ilícitas. *Drugs and Addictive Behavior, 1,* 17-28.

Goldberg, D. P. & Williams, P. (1998). *A user's guide to the General Health Questionnaire.* London: Nfer-Nelson.

Grant, J. E., Potenza, M. N., Weinstein, A. & Gorelick, D. A. (2010). Introduction to behavioral addictions. *American Journal of Drug and Alcohol Abuse, 36,* 233-241. doi:10.3109/00952990.2010.491884.

Griffiths, M. D. (2015). Online Games, Addiction and Overuse of. En R. Mansell y P. Hwa Ang (eds.), *The International Encyclopedia of Digital Communication and Society* (pp. 1-8). Chichester UK: John Wiley & Sons, Inc. doi:10.1002/9781118767771.wbiedcs044.

Griffiths, M. D., Kuss, D. J., Billieux, J. & Pontes, H. M. (2016). The evolution of Internet addiction: A global perspective. *Addictive Behaviors, 53,* 193-195. doi:10.1016/j.addbeh.2015.11.001.

Grover, K., Pecor, K., Malkowski, M., Kang, L., Machado, S., Lulla, R., ... Ming, X. (2016). Effects of Instant Messaging on School Performance in Adolescents. *Journal of Child Neurology, 31,* 850-857. doi:10.1177/0883073815624758.

Hall, W., Carter, A. & Forlini, C. (2015). The brain disease model of addiction: Is it supported by the evidence and has it delivered on its promises? *Lancet Psychiatry, 2,* 105-110. doi:10.1016/S2215-0366(14)00126-6.

Hawi, N. S. & Samaha, M. (2016). To excel or not to excel: Strong evidence on the adverse effect of smartphone addiction on academic performance. *Computers & Education, 98,* 81–89. doi:10.1016/j.compedu.2016.03.007.

Instituto Nacional de Estadística. (2014). *Encuesta sobre equipamiento y uso de tecnologías de información y comunicación en los hogares. Año 2014.* Retrieved at http://www.ine.es/prensa/np864.pdf.

Kardefelt-Winther, D. (2015). Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. Problems with atheoretical and confirmatory research approaches in the study of behavioral addictions. *Journal of Behavioral Addictions 4,* 126-129. doi:10.1556/2006.4.2015.019.

Ko, C. H., Yen, J. Y., Yen, C. F., Chen, C. S. & Chen, C. C. (2012). The association between Internet addiction and psychiatric disorder: a review of the literature. *European Psychiatry, 27,* 1-8. doi:10.1016/j.eurpsy.2010.04.011

Konkolÿ Thege, B., Woodin, E. M., Hodgins, D. C. & Williams, R. J. (2015). Natural course of behavioral addictions: A 5-year longitudinal study. *BMC Psychiatry, 15,* 4. doi:10.1186/s12888-015-0383-3.

Kwan, H. C. & Leung, M. T. (2015). The path model of parenting style, attachment style, self-regulation and Smartphone addiction. In *Applied Psychology: Proceedings of the 2015 Asian Congress of Applied Psychology (ACAP 2015)* (p. 196). World Scientific.

Lorenzo-Seva, U. & Ferrando, P. J. (2006). FACTOR: A computer program to fit the exploratory factor analysis model. *Behavior Research Methods, 38,* 88-91. doi:10.3758/BF03192753.

Mardia, K. V. (1970). Measures of multivariate skewness and kurtosis with applications. *Biometrika, 57,* 519-530. doi:10.1093/biomet/57.3.519.

Marks, I. (1990). Behavioural (non-chemical) addictions. *British Journal of Addiction, 85,* 1389-1394. doi:10.1111/j.1360-0443.1990.tb01618.x.

Martínez-González, J. M., Munera-Ramos, P. & Becoña-Iglesias, E. (2013). Drogodependientes vs. usuarios de salud mental con trastornos de personalidad: su relación con la calidad de vida, la psicopatología en Eje I, el ajuste psicológico y dinámica familiar. *Anales de Psicología, 29,* 48-54. doi:10.6018/analesps.29.1.161901.

Navas, J. F., Torres, A., Cándido, A. & Perales, J. C. (2014). ¿'Nada' o 'un poco'? ¿'Mucho' o 'demasiado'? La impulsividad como marcador de gravedad en niveles problemático y no problemático de uso de alcohol e Internet. *Adicciones, 26,* 146-158.

Pedrero-Pérez, E. J. (2010). Detección de adicciones comportamentales en adictos a sustancias en tratamiento. *Trastornos Adictivos, 12,* 13-18. doi:10.1016/S1575-0973(10)70005-2.

Pedrero-Pérez, E. J., Rodríguez-Monje, M. T., Gallardo-Alonso, F., Fernández-Girón, M., Pérez-López, M. & Chicharro-Romero, J. (2007). Validación de un instrumento para la detección de trastornos de control de impulsos y adicciones: el MULTICAGE CAD-4. *Trastornos Adictivos, 9,* 269-278. doi:10.1016/S1575-0973(07)75656-8.

Pedrero-Pérez, E. J., Rodríguez-Monje, M. T. & Ruiz-Sánchez de León, J. M. (2012). Adicción o abuso del teléfono móvil. Revisión de la literatura. *Adicciones, 24,* 139-152.

Pedrero-Pérez, E. J., Ruiz-Sánchez de León, J. M. & Llanero Luque, M. (2015a). The personality and the brain: An inevitable encounter. *Papeles del Psicólogo, 36,* 54-61.

Pedrero-Pérez, E. J., Ruiz-Sánchez de León, J. M., Lozoya-Delgado, P., Rojo-Mota, G., Llanero-Luque, M. & Puerta-García, C. (2013). Sintomatología prefrontal y trastornos de la personalidad en adictos a sustancias. *Revista de Neurología, 56,* 205-213.

Pedrero-Pérez, E. J., Ruiz-Sánchez de León, J. M., Lozoya-Delgado, P., Rojo-Mota, G., Llanero-Luque, M. & Puerta-García, C. (2015b). La "Escala de Estrés Percibido": estudio psicométrico sin restricciones en población

no clínica y adictos a sustancias en tratamiento. *Psicología Conductual/Behavioral Psychology, 23*, 305-324.

Pedrero-Pérez, E. J., Ruiz-Sánchez de León, J. M., Morales-Alonso, S., Pedrero-Aguilar, J. & Fernández-Méndez, L. M. (2015c). Sintomatología prefrontal en la vida diaria: evaluación de cribado mediante el inventario de síntomas prefrontales abreviado (ISP-20). *Revista de Neurología, 60*, 385-393.

Pedrero-Pérez, E. J., Ruiz Sánchez de León, J. M., Rojo Mota, G., Morales Alonso, S., Pedrero Aguilar, J., Lorenzo Luque, I. & González Sánchez, Á. (2016). Inventario de Síntomas Prefrontales (ISP): validez ecológica y convergencia con medidas neuropsicológicas. *Revista de Neurología, 63*, 241-251.

Pemberton, R. & Wainwright, T. (2014). The end of mental illness thinking? *International Journal of Clinical and Health Psychology, 14*, 216-220. doi:10.1016/j.ijchp.2014.05.003.

Pontes, H. M., Kuss, D. J. & Griffiths, M. D. (2015). The clinical psychology of internet addiction: a review of its conceptualization, prevalence, neuronal processes, and implications for treatment. *Neuroscience and Neuroeconomics, 4*, 11-23. doi:10.2147/NAN.S60982.

Potenza, M. (2015). Perspective: behavioural addictions matter. *Nature, 522*, S62. doi:10.1038/522S62a.

Remor, E. A. & Carrobles, J. A. (2001). Versión española de la Escala de estrés percibido (PSS-14): estudio psicométrico en una muestra VIH+. *Ansiedad y Estrés, 7*, 195-201.

Reneses, B., Garrido, S., Navalón, A., Martín, O., Ramos, I., Fuentes, M., ... López-Ibor, J. J. (2015). Psychiatric morbidity and predisposing factors in a primary care population in Madrid. *International Journal of Social Psychiatry, 61*, 275-286. doi:10.1177/0020764014542815.

Rocha, K. B., Pérez, K., Rodríguez-Sanz, M., Borrell, C. & Obiols. J. E. (2011). Propiedades psicométricas y valores normativos del General Health Questionnaire (GHQ-12) en población general española. *International Journal of Clinical and Health Psychology, 11*, 125-139.

Rodríguez-Monje, M. T., Pedrero-Pérez, E. J. P., Fernández-Girón, M., Gallardo-Alonso, F. & Sanz-Cuesta, T. (2009). Detección precoz de conductas adictivas en atención primaria: utilización del MULTICAGE CAD-4. *Atención Primaria, 41*, 25-32. doi:10.1016/j.aprim.2008.04.004.

Ruiz-Sánchez de León, J. M., Pedrero-Pérez, E. J., Gálvez, S., Fernández-Méndez, L. M. & Lozoya-Delgado, P. (2015). Utilidad clínica y propiedades psicométricas del inventario de síntomas prefrontales (ISP) en el daño cerebral adquirido y las demencias degenerativas. *Revista de Neurología, 61*, 387-394.

Schou Andreassen, C. S. (2015). Online social network site addiction: A comprehensive review. *Current Addiction Reports, 2*, 175-184. doi:10.1007/s40429-015-0056-9.

Schou Andreassen, C., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E. & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of Addictive Behaviors, 30*, 252-262. doi:10.1037/adb0000160.

Seo, M., Kim, J. H. & David, P. (2015). Always connected or always distracted? ADHD symptoms and social assurance explain problematic use of mobile phone and multi-communicating. *Journal of Computer-Mediated Communication, 20*, 667-681. doi:10.1111/jcc4.12140.

Sinclair, H., Lochner, C. & Stein, D. J. (2016). Behavioural Addiction: a Useful Construct? *Current Behavioral Neuroscience Reports, 3*, 43-48. doi:10.1007/s40473-016-0067-4.

Soroush, M., Hancock, M. & Bonns, V. K. (2014). Self-control in casual games: The relationship between Candy Crush Saga™ players' in-app purchases and self-control. *Games Media Entertainment (GEM)*, 2014 IEEE (pp. 1-6). IEEE. doi:10.1109/GEM.2014.7048099.

Spada, M. M. (2015). Commentary on: Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *Journal of Behavioral Addictions 4*, 124-125. doi:10.1556/2006.4.2015.018.

Sultan, A. J. (2014). Addiction to mobile text messaging applications is nothing to "lol" about. *Social Science Journal, 51*, 57-69. doi:10.1016/j.soscij.2013.09.003.

Telefónica (2015). *La Sociedad de la Información en España 2014*. Recuperado de http://www.fundaciontelefonica.com/arte_cultura/publicaciones-listado/?tema=informe.

Van der Linden, M. (2015). Commentary on: Are we over-pathologizing everyday life? A tenable blueprint for behavioral addiction research. Addictions as a psycho-social and cultural construction. *Journal of Behavioral Addictions, 4*, 145-147. doi:10.1556/2006.4.2015.025.

Velicer, W. F. & Fava, J. L. (1998). Effects of variable and subject sampling on factor pattern recovery. *Psychological Methods, 3*, 231-251. doi:10.1037/1082-989X.3.2.231.

Wilmer, H. H. & Chein, J. M. (2016). Mobile technology habits: patterns of association among device usage, intertemporal preference, impulse control, and reward sensitivity. *Psychonomic Bulletin & Review*, 1-8. Publicación online. doi:10.3758/s13423-016-1011-z.

Yip, S. W., Morie, K. P., Xu, J., Constable, R. T., Malison, R. T., Carroll, K. M. & Potenza, M. N. (2016). Shared microstructural features of behavioral and substance addictions revealed in areas of crossing fibers. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*. Retrived at http://www.biologicalpsychiatrycnni.org/article/S2451-9022(16)30003-9/fulltext. doi:10.1016/j.bpsc.2016.03.001.

Young, K. S. (2017). The evolution of Internet addiction. *Addictive Behaviors, 64*, 229-230. doi:10.1016/j.addbeh.2015.05.016.

Appendix 1. *MULTICAGE-TIC*

		YES	NO
1	Do you spend more time than you think you should connected to the Internet for purposes other than work?		
2	Have your family members complained about the number of hours you dedicate to the Internet?		
3	Is it difficult for you to remain away from the Internet for several consecutive days?		
4	Do you have problems in controlling your impulse to connect to the Internet, or have you failed in trying to reduce the time you dedicate to being connected?		
5	Do you use the mobile phone more often or for longer time periods than you should?		
6	Have your family members or friends at any time commented that you make too much use of the mobile phone for chatting or sending messages?		
7	On a day that you don't have your mobile phone with you, do you feel uneasy or as if something very important is missing?		
8	Have you tried to reduce your use of the mobile phone without achieving this in a satisfactory way?		
9	Do you dedicate more time than you think you should to playing Video Games, using a console, computer or mobile phone?		
10	Does your family complain that you dedicate too much time to playing Video Games, using a console, computer or mobile phone?		
11	Is it difficult for you to be several days without playing Video Games using the console, computer or mobile phone?		
12	Have you failed in trying to reduce the time you dedicate to playing Video Games, using a console, computer or mobile phone?		
13	Do you spend more time than you think you should chatting with your contacts via WhatsApp (or similar application) over the mobile phone?		
14	Do your family members or friends complain that you dedicate too much time to chatting via WhatsApp (or similar application)?		
15	Is it difficult for you to spend time without checking if you have new messages in WhatsApp (or similar application)?		
16	Have you failed in trying to reduce the time you dedicate to WhatsApp (or similar application)?		
17	Do you dedicate more time than you think you should to participating in social networks, like Facebook, Twitter, Instagram or similar networks?		
18	Do your family members or friends complain that you dedicate too much time to checking and communicating via Facebook (or Twitter, Instagram or similar networks)?		
19	Is it difficult for you to spend time without checking Facebook (or Twitter, Instagram or similar networks) to check whether there is new information?		
20	Have you failed in trying to reduce the time you dedicate to Facebook (or Twitter, Instagram or similar networks)?		