



Review

The measurement of Internet addiction: A critical review of existing scales and their psychometric properties



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ABSTRACT

Internet addiction is a recently recognized disorder which has received increasing attention worldwide over the past two decades. This focus has led to the development of several screening tools measuring different aspects of Internet use, and more particularly Internet addiction. However, a synthesis of the information regarding the validity and usefulness of these different scales is lacking and would help inform researchers and clinicians in their choice of measures when assessing for Internet addiction. The main goal of this study was therefore to identify all the existing measures of Internet addiction and to review the psychometric properties of the most frequently used ones. Five electronic databases were searched using the key words: internet use disorder, Internet addiction, problematic internet use, pathologic internet use, cyber dependence, and scale, test, questionnaire, tool, assessment and inventory. Forty-five tools assessing Internet addiction were identified, of which only seventeen had been evaluated more than once in terms of their psychometric properties. Most of the existing scales for Internet addiction require further validation work but some of them already demonstrate promising psychometric properties. Given the interest in this phenomenon, it seems important for the field to promote the use of validated and well-established measures.

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1. Introduction

Internet addiction, otherwise called pathological or problematic Internet use is a recent and increasingly recognized disorder (Block, 2008; Lopez-Fernandez, Freixa-Blanxart, & Honrubia-Serrano, 2013) which has received growing attention worldwide over the past two decades. It also has been the subject of numerous debates, particularly concerning its terminology, definition and theoretical basis (Fu, Chan, Wong, & Yip, 2010; Lortie & Guitton, 2013; Meerkerk, Van Den Eijnden, Vermulst, & Garretsen, 2009; Pezoa-Jares, Espinoza-Luna, & Vasquez-Medina, 2012). The still controversial term “Internet addiction”, appears to be the most frequently used in the literature (Frangos, Frangos, & Kiohos, 2010; Lai et al., 2013; Zhang & Xin, 2013). In our present review, this term will be considered to be synonymous with compulsive, pathological or problematic Internet use (Lai et al., 2013; Lee et al., 2013; Osada, 2013; Widianto, Griffiths, Brunnsden, & McMuran, 2008).

Furthermore, a standard and consensual definition of Internet addiction is still lacking (Spada, 2014). It is mainly defined as a maladaptive pattern of Internet use, generally time-consuming, that leads to clinically significant impairment or distress (Goldberg, 1995; Shaw & Black, 2008; Weinstein & Lejoyeux, 2010). For many authors, Internet addiction implies at least an inability or a difficulty to control the time spent online (Beard, 2005; Cash, Rae, Steel, & Winkler, 2012; Lopez-Fernandez et al., 2013), associated with negative, behavioral, psychosocial or physical consequences (Wallace & Masiak, 2011; Zhang & Xin, 2013). Furthermore, Internet addiction has been compared to a non-substance-related or behavioral addiction (Lopez-Fernandez et al., 2013), to an impulse control disorder (Pezoa-Jares et al., 2012) or to a combination of both (Aboudjaoude, Koran, Gamel, Large, & Serpe, 2006; Kim, Park, Ryu, Yu, & Ha, 2013). Among other debates, the usefulness of Internet addiction as a concept, as opposed to the existence of Internet-facilitated addictions that would exist offline has been questioned (Spada, 2014).

The increasing research interest in Internet addiction has led to the development of numerous scales assessing this disorder. Literature reviews focused on Internet addiction (Atwal, Klaus, & Daily, 2012; Beard, 2005; Cash et al., 2012; Chou, Condrón, & Belland, 2005; Jia & Jia, 2009; Ko, Yen, Chen, & Chen, 2012; Lopez-Fernandez et al., 2013; Moreno, Jelenchik, Cox, Young, & Christakis, 2011; Pezoa-Jares et al., 2012; Shaw & Black, 2008; Widianto & Griffiths, 2006; Özcan & Gokcearslan, 2013) and meta-analyses (Byun et al., 2009; Weinstein & Lejoyeux, 2010) have included between 3 and 13 scales. Other authors have suggested even greater numbers, quoting “at least 13 instruments” for evaluating Internet addiction (Moreno et al., 2011) or 14 in a recent study (Lortie & Guitton, 2013).

While several of these studies report on a number of the existing scales designed to assess Internet addiction, none of them have attempted to provide an exhaustive overview of them, even the three studies focused on assessment methods (Beard, 2005; Lortie & Guitton, 2013; Wallace & Masiak, 2011). Furthermore, none of these scales has obtained consensus as the gold-standard (Demetrovics, Szeredi, & Rozsa, 2008; Lai et al., 2013; Meerkerk et al., 2009; Pezoa-Jares et al., 2012; Wallace & Masiak, 2011). To date, therefore, a synthesis of the information regarding the validity and usefulness of these different scales is lacking. Such a review would help inform researchers and clinicians in their choice of measures when assessing for Internet addiction and help the field to move towards the adoption of well-established and validated tools. The main goal of the present study was therefore to identify all the existing instruments aiming to assess Internet addiction and to report on their psychometric properties.

2. Materials and methods

2.1. Data-gathering

In this review, we identified published studies focusing on Internet addiction and more specifically the assessment of Internet addiction. Existing scales were identified by searching the academic databases EBSCO (Elton B. Stephens Co.), ScienceDirect, PubMed, ACM DL (Association for Computing Machinery – Digital Library) and IEEE Xplore Digital Library (Institute of Electrical and Electronics Engineers) from July to November 2013. The English keywords used were: internet use disorder, internet addiction, problematic internet use, pathological internet use, and cyber dependence, combined with scale, test, questionnaire, assessment, measure, and inventory. The first search on EBSCO (Medline, PsycInfo) revealed 68 papers focused on Internet addiction measurement. The second search on PubMed revealed 42 papers including 5 not previously identified, the third search on Science Direct yielded 14 publications of which one was a new addition and the final searches on ACM DL and IEEE Xplore yielded 6 publications with no new additions. In a second step, we read all those papers (74) and used Google in order to retrieve other records that we found references for but were not yet included in our review (18). Despite contacting the authors of papers which we did not have access to, we were unable to obtain 17 manuscripts and another 9 were published in Chinese and were therefore excluded because the authors could not accurately interpret Chinese.

2.2. Inclusion and exclusion criteria

We only included manuscripts measuring Internet addiction with scales, interviews or diagnostic criteria (Table 1); those evaluating other aspects of Internet use (attitudes, consequences or motives) were not included given the focus of the present study on Internet “addiction”. Assessment scales for which no information about psychometric properties was available (i.e., not reported or published in a language we could not interpret) were included in Table 1 but not described in the results section; only scales with at least two validating studies were included. In Table 1, papers including three or more authors were cited using “the first author et al.” for clarity.

2.3. Psychometric properties

Psychometric properties were not always provided or only partially, but when possible we reported the internal consistency, the main theoretical basis and the characteristics of the scales (number of items and response modalities) and of the tested samples (number, mean age and sex ratio) in Table 1, as well as information regarding the validity and reliability in the results section.

The number of citations of the original papers was presented in Table 1 in order to estimate studies using each scale. Harzing’s Publish or Perish software, frequently used for citation analyses in various field of study (Hodge, Lacasse, & Benson, 2011), was used to retrieve all academic citations (Google Scholar and Microsoft Academic Search).

Reliability was assessed through test–retest reliability and internal consistency. According to Cicchetti (1994), a test–retest reliability coefficient can be considered “fair” (between .40 and .59), “good” (between .60 and .74) and “excellent” (between .75 and higher); internal consistency coefficients (Cronbach alphas are presented in Table 1) may be considered “fair”, between .70 and .79, “good” between .80 and .89, and “excellent” from .90 upwards.

Table 1
Measures of Internet addiction.

Measures	Authors	Citations	Theoretical basis	It	S	Authors	Countries	α	Samples		
									n	M	SR
Adolescent Computer Addiction Test (ACAT)	Siomos et al., 2009	1	Pathological gambling	20	5	Siomos et al., 2009	Greece	.93	1389	ado	–
Adolescent Pathological Internet Use Scale (APIUS)	Lei & Yang, 2007	11	Cognitive-behavioral theory	38	5	Lei & Yang, 2007	China	.80–.94	1331	ado	1.0
Checklist for the Assessment of Internet and Computer Game Addiction (AICA-C)	Wölfling, Müller, & Beutel, 2010	5	Substance dependence	14	2	Wölfling et al., 2010	Germany	.89	141	23.3	16.6
Chen Internet Addiction Scale (CIAS)	Chen et al., 2003	131	Substance dependence and pathological gambling	26	4	Chen et al., 2003	China	.93	844	–	–
				26	4	Ko et al., 2005b	Taiwan	.94	454	15.2	2.1
				26	4	Kesici & Sahin, 2010	Turkey	.94	146	21.4	.7
				26	4	Ramezani et al., 2012	Iran	.93	214	23	–
				26	4	Lai et al., 2013	China	.97	844	15.9	.6
				26	4	Zhang & Xin, 2013	China	–	467	23.3	.5
Chinese Internet Addiction Inventory (CIAI)	Huang et al., 2007	42	Pathological gambling	31	5	Huang et al., 2007	China	.80–.90	516	20.7	.9
Compulsive Internet Use Scale (CIUS)	Meerkerk et al., 2009	178	Substance dependence and pathological gambling	14	5	Meerkerk et al., 2009	Netherlands	.89	447	38.5	.9
				14	5	Alavi et al., 2011	Iran	.89	400	Us	–
				9	4	Cartierre et al., 2011	France	.85	269	13.8	.9
				14	5	Khazaal et al., 2012	Switzerland (arabic)	.78	155	17.6	.9
				–	–	Peukert et al., 2012	Germany	–	2506	Us	–
				14	5	Wartberg et al., 2013	Germany	.92	1723	15.5	1.0
				14	5	Guertler et al., 2014b	Germany	.90	292	35.2	4.3
				14	5	Guertler et al., 2014a	Germany	.90	8132	14–64	4.3
				91	2	Pratarelli et al., 1999	USA	–	341	22.8	.9
				74	5	Pratarelli & Browne, 2002	USA	.57–.89	524	20.4	1.0
Diagnostic Criteria of Internet Addiction (DC-IA)	Ko et al., 2005a	166	Substance dependence and pathological gambling	13	2	Ko et al., 2005a	Taiwan	–	454	15.2	2.1
Diagnostic Scale For Internet Addiction Disorder (DSFIAD)	Liu, Hao, Yang, Qi, & Luo, 2006	0	–	17	5	Liu et al., 2006	China	–	1831	–	–
Excessive Internet Use Risk Scale (SNUI)	Kaliszewska-Czeremska, 2007	2	Cognitive-behavioral theory	41	5	Kaliszewska-Czeremska, 2007	Poland	.94	361	25.3	.9
				41	5	Kaliszewska-Czeremska, 2011	Poland	.94	405	35	.9
Generalized Problematic Internet Use Scale (GPIUS)	Caplan, 2002	500	Cognitive-behavioral theory	29	5	Caplan, 2002	USA	.78–.85	386	20	.4
				29	5	Li et al., 2008	China	.91	667	–	–
				29	5	Alavi et al., 2009	Iran	.90	400	Us	–
				15	8	Caplan, 2010	USA	.91	785	33.1	2.2
Generalized Problematic Internet Use Scale 2 (GPIUS-2)	Caplan, 2010	83	Cognitive-behavioral theory	15	6	Gamez-Guadix et al., 2012	Mexico	.90	1491	14.5	1.1
				15	8	Fioravanti et al., 2013	Italia	.78–.89	371	18.0	.5
				15	6	Gamez-Guadix et al., 2013	Spain	.91	1021	14.9	.6
				8	2	Young, 1996	USA	–	396	15.5	.6
Internet Addiction Diagnostic Questionnaire (IADQ)	Young, 1996	22	Pathological gambling	8	2	Young, 1996	USA	–	396	15.5	.6
				8	2	Johansson & Götestam, 2004	Norway	.75	3237	14.9	1.0

				10	2	Shek et al., 2008	China	.75	6121	ado	1.0
				8	2	Dowling & Quirk, 2009	Australia	.72	424	22.2	.4
				8	2	Frangos et al., 2010	Greece	.71	1876	19.5	.8
				8	2	Osada, 2013	Japan	.72	299	19.4	1.6
Internet Addiction Disorder – Diagnostic Criteria (IAD-DC)	Goldberg, 1995	15	Substance dependence	7	2	Goldberg, 1995	USA	–	–	–	–
				7	2	Shek et al., 2008	China	.68	6121	ado	1.0
Internet Addiction Disorder Diagnostic Scale (IADDS)	Zan, Liu, & Liu, 2008	0	Substance dependence	13	2	Zan et al., 2008	China	–	963	–	–
Internet Addiction Predict Test (IAPT)	Fan, Su, Cao, & Jin, 2008	3	–	56	–	Fan et al., 2008	China	.72	1363	13.6	1.1
Internet Addiction Questionnaire (IAQ)	Wang, 2001	136	Cognitive-behavioral theory	28	4	Wang, 2001	Australia	.94	217	24.9	0.4
				10	5	Lu et al., 2011	Japan	.85	146	42.4	1.7
Internet Addiction Questionnaire (IAQ)	Nyikos et al., 2001	2	Pathological gambling	30	5	Nyikos et al., 2001	Hungary	.92	182	26.3	2.7
Internet Addiction Scale (IAS)	Nichols & Nicki, 2004	131	Substance dependence	31	5	Nichols & Nicki, 2004	Canada	.95	234	18–	1.3
										24	
				31	5	Canan et al., 2010	Turkey	.92	300	16.3	1.2
Internet Addiction Test (IAT)	Young, 1998	1096	Pathological gambling	20	5	Young, 1998	USA	–	496	–	–
				–	–	Kim, 2000	Korea, South	–	–	–	–
				20	5	Widyanto & McMurran, 2004	UK	.71	86	25.4	.5
				20	5	Ngai, 2007	China	.63–	988	ado	–
								.82			
				20	5	Chang & Man Law, 2008	China	–	205	Us	.8
				20	5	Khazaal et al., 2008	Switzerland	.93	246	24.1	.4
				20	5	Alavi et al., 2010	Iran	.88	233	Us	–
				20	5	Korkeila et al., 2010	Finland	.92	1825	24.7	.8
				20	6	Poprawa, 2011	Poland	.93	6119	22.7	1.7
				20	5	Widyanto et al., 2011	UK	–	225	25.2	.4
				20	5	Barke et al., 2012	Germany	.89–	1882	23.8	.8
								.91			
				20	5	Chong Guan et al., 2012	Malaysia	.91	162	19	.5
				20	6	Jelenchik et al., 2012	USA	.83–	215	18.8	–
								.91			
				20	3	Panayides & Walker, 2012	Greece	–	604	ado	.9
				20	5	Pawlikowski et al., 2012	Germany	.89	584	25.6	.5
				12	5		Germany	.84	465	31.8	1.1
				20	5	Puerta-Cortès et al., 2012	Spain	.89	1117	20.9	.6
				20	5	Faraci et al., 2013	Italia	.91	485	24.0	0.4
				20	6	Hawi, 2013	Lebanon	.92	817	15	–
				20	6	Keser et al., 2013	Turkey	.90	480	ado	–
				–	–	Kim et al., 2013	Korea, South	–	52	21.7	9.4
				20	5	Lai et al., 2013	China	.93	844	15.9	.6
				20	5	Lee et al., 2013	Korea, South	.91	279	32.9	.5
				20	5	Osada, 2013	Japan	.93	299	19.4	1.6
				20	5	Popovic-Citic & Markovic, 2013	Slovenia	.91	814	12.9	.9
				20	5	Karim & Nigar, 2013	Bangladesh	.89	177	22.3	1.2
				20	5	Watters et al., 2013	Canada	.93	1948	17.0	.6
				20	5	Zhang & Xin, 2013	China	–	467	23.3	.5
Internet Dependency Scale (IDS)	Gunuc & Kayri, 2010	13	DSM-IV data, opinions of students and literature	20	5	Guertler et al., 2014b	Germany	.89	292	35.2	4.3
				35	5	Gunuc & Kayri, 2010	Turkey	.94	754	15.8	1.4
Internet Over-use Scale (IOS)	Jenaro, Flores, Gomez-Vela,	105	Pathological gambling	35	5	Kayri, 2010	Turkey	.94	754	15.8	1.4
				23	6	Jenaro et al., 2007	Spain	.88	337	21.6	.3

(continued on next page)

Table 1 (continued)

Measures	Authors	Citations	Theoretical basis	It	S	Authors	Countries	α	Samples		
									n	M	SR
Internet Related Addictive Behavior Inventory (IRABI)	Gonzalez-Gil, & Caballo, 2007 Brenner, 1997	497	Substance dependence	32	2	Brenner, 1997	USA	.87	563	34	2.7
Internet Related Experiences Questionnaire (IREQ – CER1)	Beranuy et al., 2009	12	Substance dependence and pathological gambling	20	4	Beranuy et al., 2009	Spain	.77	1879	15.5	.8
Internet Related Problem Scale (IRPS)	Armstrong et al., 2000	362	Substance dependence	10	4	Casas et al., 2013	Spain	.79	525	14.1	.9
				20	10	Armstrong et al., 2000	Australia	.87	52	–	1.2
				20	4	Widyanto et al., 2008	UK	.62–.84	79	36.6	.2
				20	10	Widyanto et al., 2011	UK	.60–.90	225	25.2	.4
Internet Usage Scale (IUS)	Monetti et al., 2011	2	Participants' attitudes regarding how Internet usage affects their behavior	22	4	Monetti et al., 2011	USA	.74	947	ado	.9
Internet Use Survey (IUS)	Rotunda, Kass, Sutton, & Leon, 2003	45	Substance dependence and pathological gambling	32	5	Rotunda et al., 2003	USA	.65–.90	393	27.6	.8
Internet Using Test (IUT)	Poprawa, 2011	1	–	22	6	Poprawa, 2011	Poland	.79–.89	6119	22.7	1.7
Internet-user Assessment Screen (IAS) Korea Internet addiction scale (K-scale)	Chow, Leung, Ng, & Yu, 2009 Kang & Oh, 2001	12 4	Pathological gambling –	26	2	Chow et al., 2009	China	–	3523	12	1.2
				40	4	Kang & Oh, 2001	Korea, South	–	–	–	–
				40	4	Kim et al., 2002	Korea, South	.95	–	–	–
				20	4	Kim, 2008	Korea, South	.89–.91	–	–	–
				20	4	Lee et al., 2013	Korea, South	–	279	32.9	.5
Korean Internet addiction Index (KIAI) Online Cognition Scale (OCS)	Park, 2005 Davis et al., 2002	3 372	– Cognitive-behavioral theory	23	–	Park, 2005	Korea, South	>.75	1037	–	–
				36	7	Davis et al., 2002	USA	.94	211	21.7	.9
				36	7	Özcan & Buzlu, 2005	Turkey	.91	148	21	.3
				36	7	Zec, 2005	Croatia	.94	657	23.7	20.1
				–	–	Song & Yang, 2007	China	.93	538	ado	–
				10	7	Jia & Jia, 2009	USA	.85	267	Us	1.8
				–	–	Wang et al., 2009	China	–	123	–	–
Preliminary proposed diagnostic criteria for pathological Internet use	Wang et al., 2009	4	–	–	–	–	–	–	–		
Problematic Internet Usage Scale (PIUS)	Ceyhan, Ceyhan, & Gürcan, 2007 Beard & Wolf, 2001	44 548	Experts' opinions and suggestions Substance dependence	33	5	Ceyhan et al., 2007	Turkey	.94	1658	Us	–
				8	2	Beard & Wolf, 2001	USA	–	–	–	–
Problematic Internet Use Diagnostic-Interview (PIUD-I) Problematic Internet Use Questionnaire (PIUQ)	Demetrovics et al., 2008	58	Pathological gambling	18	5	Demetrovics et al., 2008	Hungary	.87	1037	23.3	1.1
				18	5	Kelley & Gruber, 2010	USA	.91	278	19	.8
				18	5	Koronczai et al., 2011	Hungary	.89	438	16	.8
				–	–	–	–	.91	963	33.6	.9
				9	5	–	Hungary	.84	438	16	.8
				–	–	–	–	.87	963	33.6	.9
				12	6	Kern & Acier, 2013	France	.82–.77	150	20	2.0
Problematic Internet Use Scale (PIUS)	Morahan-Martin & Schumacher, 2000	1004	Substance dependence	13	2	Morahan-Martin & Schumacher, 2000	USA	.87	277	20.7	1.1
Proposed diagnostic criteria for internet addiction	Tao et al., 2010	131	Substance dependence	8	2	Tao et al., 2010	China	–	408	17.6	12.6
Questionnaire of Internet use related problems (PRI)	De Gracia Blanco et al., 2002	35	Substance dependence and pathological gambling	19	5	De Gracia Blanco et al., 2002	Spain	.91	1664	15–54	1.6
Scale for Internet Addiction of Lima (SIAL)	Lam-Figueroa et al., 2011	2	Pathological gambling	11	4	Lam-Figueroa et al., 2011	Peru	.854	248	14	1.1
Thatcher's Problematic Internet Use Questionnaire (TPIUQ)	Thatcher & Goolam, 2005	51	Pathological gambling	20	5	Thatcher & Goolam, 2005	South Africa	.90	1795	–	2.9

Use, Abuse and Dependence on Internet inventory (UADI)	Del Miglio et al., 2001	15	Substance dependence	80	5	Del Miglio et al., 2001	Italia	.76–.93	244	28.7	2.0
				39	5	Gnisci et al., 2011	Italia	.85–.91	820	17.1	.9
Virtual Addiction Survey (VAS)	Greenfield, 1999 Zhang & Xin, 2013	194	Pathological gambling	10	2	Greenfield, 1999	USA	.74	236	21.5	1.1
		1	Substance dependence and pathological gambling	20	5	Zhang & Xin, 2013	China	–	17251	33	2.4
									467	23.3	.5

Note: Citations = number of citations; It = number of items; S = number of response modalities; α = coefficient of internal consistency; n = size; M = mean age; SR = sextario; ado = adolescents; Us = University students.

Validity was mainly evaluated through construct validity which can be estimated by considering the relationship between the scale, expert opinion and other validated measures of Internet addiction (concurrent validity), as well as the relationship between the scale and related variables frequently associated with Internet addiction (convergent validity). Therefore, when available, regression coefficients (β) or correlation coefficients (r) between Internet addiction and time spent online (Kesici & Sahin, 2010) and depressive symptoms (Wallace & Masiak, 2011) were reported. Kappa values (degree of agreement between two assessments) and diagnostic accuracy were also reported. Accuracy can be considered to be “high” between .09 and higher, “moderate” between .07 and .09 and “low” between .05 and .07 (Swets, 1988). Kappa values can be considered to be “very good” (.81–1.00), “good” (.61–.80), “moderate” (.41–.60) or “fair” (.21–.40) (Landis & Koch, 1977). Results of principal component analysis and principal factor analysis were reported for factorial validity (Cicchetti, 1994).

3. Results

Forty-five assessment tools evaluating Internet addiction were identified (23 languages). These measures are presented in Table 1 by alphabetical order. Among these scales, only 17 had more than one study evaluating their psychometric properties, and only 10 had three or more evaluating studies. These most frequently evaluated tools and their psychometric characteristics are detailed below and ranged in descending order according to the amount of available empirical data.

3.1. Most evaluated tests

3.1.1. Reliability and validity

The Internet Addiction Test – IAT (Young, 1998), based on the Internet Addiction Diagnostic Questionnaire – IADQ (Young, 1996) is composed of 20 items and was originally scored on a 5-point Likert scale ranged from “rarely” to “always”, and which was later modified to a 6-point scale with one response option being “does not apply” (Young & Nabuco de Abreu, 2011). The cut-off scores proposed for the 5-point scale IAT differentiate normal Internet users (20–39) and users with frequent (40–69) and significant (70–100) problems due to their Internet use; those of the 6-point scale differentiate normal Internet users (0–30) and users with mild (31–49), moderate (50–79) and severe Internet addiction (80–100), however, few studies have evaluated the usefulness of these cut-off scores. A cut-off score of 53, screening for Internet addiction, was proposed for the Japanese form (Osada, 2013). In addition little data is available regarding the properties of the scale using the 5-point scoring system (Barke, Nyenhuis, & Kröner-Herwig, 2012; Guertler et al., 2014b). The IAT also exists with modified items (Panayides & Walker, 2012), in a 12 (Pawlikowski, Alstötter-Gleich, & Brand, 2012), a 17 (Zhang & Xin, 2013), and an 18-item form (Chang & Man Law, 2008; Karim & Nigar, 2013; Lai et al., 2013), as well as in an interview form (Bowen & Firestone, 2011). It was used as the basis for the development of many scales such as the Adolescent Computer Addiction Test – ACAT (Siomos, Floros, Mouzas, & Angelopoulos, 2009) or the Problematic Internet Use Questionnaire – PIUQ (Demetrovics et al., 2008). Its test–retest reliability appeared to be satisfactory; between $r = .73$ and $r = .88$ (Alavi, Jannatifard, Maracy, & Rezapour, 2010; Barke et al., 2012; Kesici & Sahin, 2010; Lee et al., 2013; Osada, 2013; Panayides & Walker, 2012) as its internal consistency (see Table 1). Concurrent validity with the Chen Internet Addiction Scale – CIAS (Lai et al., 2013), the IADQ (Lee et al., 2013), the Generalized Problematic Internet Use Scale 2 – GPIUS-2 (Barke et al., 2012), the Compulsive Internet Use Scale – CIUS

(Alavi, Jannatifard, Eslami, & Rezapour, 2011; Guertler et al., 2014b) and the Internet Related Problem Scale – IRPS (Widyanto, Griffiths, & Brunnsden, 2011) was good or excellent (from $r = .46$ to $r = .90$), as was convergent validity with time spent online (between $r = .19$ and $r = .53$) (Barke et al., 2012; Khazaal et al., 2008; Lai et al., 2013; Ngai, 2007; Popovic-Citic & Markovic, 2013; Puerta-Cortès, Carbonell, & Chamarro, 2012; Widyanto et al., 2011) and depressive symptoms ($r = .23$, $p < .01$) (Lee et al., 2013). The 12-item form of the IAT has shown satisfactory concurrent validity with the CIUS ($r = .89$, $p < .001$) and convergent validity with time spent online ($r = .37$, $p < .001$) and depression ($r = .33$, $p < .01$) (Pawlikowski et al., 2012).

The Compulsive Internet Use Scale – CIUS (Meerkerk et al., 2009) originally included 14 items with a 5-point Likert scale, ranged from “never” to “very often”. However, it has also been validated in a 9-item form for adolescents (Cartierre, Coulon, & Demerval, 2011) and exists in a 17-item form (van der Aa et al., 2009). Three cut-off scores were proposed: 18, 21 (Guertler et al., 2014b), and 37 (Alavi et al., 2011). The CIUS revealed good split-half reliability ($r = .89$) (Alavi et al., 2011). Good concurrent validity was found (from $r = .70$ and $r = .81$) with the Online Cognition Scale – OCS (Meerkerk et al., 2009), the IAT (Alavi et al., 2011; Guertler et al., 2014b) and the IADQ (Alavi et al., 2011). The CIUS also showed good convergent validity with time spent online; between $r = .33$ and $r = .68$ (Alavi et al., 2011; Guertler et al., 2014a; Meerkerk et al., 2009) and $\beta = 2.42$, $p < .001$ (Khazaal et al., 2012).

The Internet Addiction Diagnostic Questionnaire – IADQ (Young, 1996) was the first scale created for Internet addiction. The original IADQ included eight items with Yes/No response but other versions, such as a seven or a 10-item version have been used (Shek, Tang, & Lo, 2008). In the original version, a score equal or higher than 5 is used to discriminate Internet addicts than non addicts, and scores between 3 and 4 has been used to classified at-risk users (Johansson & Götestam, 2004), however, the distinction between these scores has been found to lack accuracy (Dowling & Quirk, 2009). The split-half reliability has been reported to be good ($r = .72$) (Johansson & Götestam, 2004). Its concurrent validity has been found to be satisfactory when tested against the CIAS (from $r = .27$ to $r = .40$, $p < .01$) (Kesici & Sahin, 2010), as its convergent validity with time spent online ($r = .21$, $p < .001$) (Shek et al., 2008).

The Chen Internet Addiction Scale – CIAS (Chen, Weng, Su, Wu, & Yang, 2003) is composed of 26 items and scored on a 4-point Likert scale, ranging from “very unlike me” to “very like me”. The screening and diagnostic properties of several cut-off points have been tested (Ko et al., 2005b); suggesting the accuracy of 58 for screening and 64 for diagnosis. It has been shown to present good psychometric properties. Its internal consistency has consistently been shown to be excellent. Its test–retest reliability has been reported to be good: $r = .83$ and $r = .88$ (Chen et al., 2003; Kesici & Sahin, 2010). The CIAS has shown satisfactory concurrent validity with the IADQ, (from $r = .27$ to $r = .40$, $p < .01$) (Kesici & Sahin, 2010) and the IAT (from $r = .46$ and $r = .85$, $p < .001$) (Lai et al., 2013; Ramezani, Salehi, Namiranian, & Salehi, 2012), and convergent validity has been evaluated with time spent online ($r = .48$, $p < .001$) (Chen et al., 2003). Agreement between the Diagnostic Criteria of Internet Addiction – DC-IA (Ko, Yen, Chen, Chen, & Yen, 2005a) and the CIAS has revealed a high diagnostic accuracy: 89.6% (Ko et al., 2005b). Its Kappa coefficients for the proposed diagnostic cut-off have ranged between $\kappa = .46$ and $\kappa = .61$ (Ko et al., 2005a).

The Online Cognition Scale – OCS (Davis, Flett, & Besser, 2002) is composed of 36 items on a 7-point Likert scale, ranging from “strongly disagree” to “strongly agree”. No cut-off score is available for this scale. The internal consistency has generally been found to be excellent as has the test–retest reliability ($r = .90$) (Song & Yang,

2007; Özcan & Buzlu, 2005). Concurrent validity with the CIUS (Meerkerk et al., 2009) was good ($r = .70$, $p < .001$). Convergent validity has been reported to be satisfactory with time spent on line ($r = .16$, $p < .05$ and $\beta = .13$, $p < .001$) (Zec, 2005; Özcan & Buzlu, 2005) and depressive symptoms ($r = .33$, $p < .001$) (Özcan & Buzlu, 2005).

The Generalized Problematic Internet Use Scale 2 – GPIUS-2 (Caplan, 2010) was at first composed of 29 items scored on an 8-point Likert scale (GPIUS; Caplan, 2002). A cut-off score of 63 was proposed for the GPIUS (Alavi, Jannatifard, Maracy, & Rezapour, 2009) but none for the GPIUS-2. The first version revealed good test–retest reliability ($r = .73$, $p < .01$) (Li, Wang, & Wang, 2008), split-half reliability ($r = .70$ and $r = .87$) (Alavi et al., 2009; Li et al., 2008) and convergent validity with depression (from $r = .19$ to $r = .40$, $p < .01$) (Caplan, 2002). The GPIUS-2 is composed of 15 items on an 8-point Likert scale ranging from “strongly disagree” to “strongly agree”. It has been suggested by the author that this 8-point scale should be replaced by a 7-point scale (S. Caplan, personal communication, November 8, 2013). The scale has also revealed good concurrent validity with the IAT (between $r = .78$ and $r = .82$) (Barke et al., 2012; Fioravanti, Primi, & Casale, 2013) and convergent validity with time spent online ($r = .44$, $p < .001$) and depression ($r = .27$, $p < .001$) (Gamez-Guadix, Villa-George, & Calvete, 2012).

The Problematic Internet Use Questionnaire – PIUQ (Demetrovics et al., 2008) was based on a previous version of the Internet Addiction Questionnaire – IAQ (Nyikos, Szeredi, & Demetrovics, 2001) and is composed of 18 items, scored on a 5-point Likert scale ranging from “never” to “always”. A nine-item (Koronczai et al., 2011) and 12-item form have been proposed (Kern & Acier, 2013). A cut-off score of 41 has been recommended for the 15-item form and one of 22 for the 9 item-form (Koronczai et al., 2011). The PIUQ test–retest reliability was evaluated in one study: $r = .90$, $p < .0001$ (Demetrovics et al., 2008). Convergent validity was found to be satisfactory with depression (between $r = .20$ and $r = .29$, $p < .01$) (Kelley & Gruber, 2010). The 12-item form showed good concurrent validity with the IAT ($r = .83$, $p < .01$) (Kern & Acier, 2013).

The Internet Related Problem Scale – IRPS (Armstrong, Phillips, & Saling, 2000) was based on the Internet Related Addictive Behavior Inventory – IRABI (Brenner, 1997). The IRPS is composed of 20 items with a 10-point Likert scale, ranging from “not true at all” to “extremely true”. No cut-off score seems to be available. Concurrent validity with the IAT was high ($r = .90$, $p < .01$) (Widyanto et al., 2011). The scale showed good convergent validity with time spent on Internet (from $r = .22$ to $r = .75$, $p < .01$) (Armstrong et al., 2000; Widyanto et al., 2011).

3.1.2. Factor structure

Results from factor analyses have revealed a large degree of inconsistency, including for the IAT with different authors proposing between 1 and 6-factor models. The 1-factor solution has been found in four studies (Faraci, Craparo, Messina, & Severino, 2013; Hawi, 2013; Khazaal et al., 2008; Korkeila, Kaarlas, Jääskeläinen, Vahlberg, & Taiminen, 2010). This unique factor has been called “Internet problematic use” (Khazaal et al., 2008) or “Dependent use” (Korkeila et al., 2010). The most frequently retrieved solution was composed of 2 factors labeled “Preoccupation” and “Loss of control” (Barke et al., 2012), “Emotional and cognitive preoccupation” and “Loss of control and interference with daily life” (Faraci et al., 2013), “Dependent use” and “Excessive use” (Jelenchik, Becker, & Moreno, 2012), “Salient use” and “Loss of control” (Korkeila et al., 2010), “Inability to control Internet use and consequences” and “Preoccupation, responses to deprivation and replacement of real to virtual social relationships” (Popovic-Citic & Markovic, 2013), and “Time/control” and “Stress/compensate”

(Watters, Keefer, Kloosterman, Summerfeldt, & Parker, 2013). A 2-factors solution (i.e., Loss of control and time management, and Craving and social problem) has also been retrieved for the 12-item IAT (Pawlikowski et al., 2012). Factors retrieved in studies revealing a 3-factor solution have been labeled: “Withdrawal and social problem”, “Time management and performance” and “Reality substitution” (Chang & Man Law, 2008), “Withdrawal and social problems”, Time management and performance” and “Reality substitute” (Lai et al., 2013), “Social interactive problems”, “Virtual reality” and “Obsession and impulsion” (Osada, 2013), “Outcomes”, “Emotional and cognitive factors” and “Time management” (Puerta-Cortès et al., 2012), and “Emotional/psychological conflict”, “Time management issues” and “Mood modification” (Widyanto et al., 2011). A four-factor model has also been retrieved, in which the factors were named “Neglect of duty”, “Online dependence”, “Virtual fantasies” and “Privacy and self-defense” (Karim & Nigar, 2013), “Difficulty to control”, “Avoidance”, “Social isolation” and “Deprivation” (Keser, Esgü, Kocadag, & Bulu, 2013), “Excessive use”, “Dependence”, “Withdrawal” and “Avoidance of reality” (Lee et al., 2013) and “Interference with family relationships”, “Salience and withdrawal”, “Overindulgence in online relationships” and “Tolerance and neglecting daily routines” (Ngai, 2007). Two studies have found a 5-factor solution composed of “Social problems”, “Effect on performance”, “Lack of control”, “Pathological use of chat rooms” and “Neglecting educational and occupational duties” (Alavi et al., 2010) and “Loss of control”, “Neglect of duty”, “Problematic use”, “Social relationship disruption” and “Email primacy” (Chong Guan, Isa, Hashim, Pillai, & Harbajan Singh, 2012). Finally, a 6-factor model has been suggested, including “Compromised social quality of life”, “Compromised individual quality of life”, “Compensatory usage of the Internet”, “Compromised academic/working careers”, “Compromised time control” and “Excitatory usage of the Internet (Ferraro, Caci, D’Amico, & Di Blasi, 2006), and “Salience”, “Excessive use”, “Neglecting work”, “Anticipation”, “Lack of control” and “Neglecting social life” (Widyanto & McMurran, 2004).

Most scales have yielded two different factor solutions when examined, including for the CIUS, the IADQ, the CIAS, the OCS, the IRPS and the GPIUS. Factors analysis of the CIUS has suggested a 1-factor solution (Cartierre et al., 2011; Guertler et al., 2014a; Khazaal et al., 2012; Meerkerk et al., 2009; Peukert et al., 2012; Wartberg, Petersen, Kammerl, Rosenkranz, & Thomasius, 2013), particularly related to “compulsive and impulse control elements” (Meerkerk et al., 2009). A 3-factor model has also been proposed, with factors entitled “Lack of control,” “Cognitive change,” and “Rumination on internet use” (Alavi et al., 2011).

A 1-factor (Johansson & Götestam, 2004) and 2-factor solution (Frangos et al., 2010) were proposed for the IADQ but were not labeled. Regarding the CIAS, a 5-factor solution, including “Compulsion”, “Withdrawal”, “Tolerance”, “Time management problem” and “Interpersonal and health problem” was suggested (Kesici & Sahin, 2010) and retrieved replicated (Ramezani et al., 2012).

Factor analysis of the OCS has revealed and confirmed a 4-factor solution composed of “Social comfort”, “Loneliness”, “Diminished impulse control” and “Distraction” (Davis et al., 2002; Zec, 2005). A 10-item version of this scale with a 2 factors solution (i.e., Dependency and Distraction composed of two or three items of each original factor) has also been proposed (Jia & Jia, 2009).

Regarding the IRPS, a 4-factor solution (Negative effects, Mood modification, Loss of control, and Increased Internet use) was proposed explaining 60.2% of the variance (Widyanto et al., 2011). Factor analysis on scores using the 4-point Likert scale form suggested a 6-factor solution also including “Negative effects”, “Mood enhancement” and “Loss of control”, and “Salience”, “Productivity” and “Lack of information” (Widyanto et al., 2008).

Factors analysis of the GPIUS revealed a 6-factor (Li et al., 2008) and a 7-factor solution accounting respectively for 60.1% and 68% of the variance (Alavi et al., 2009; Caplan, 2002). The original 7-factor solution contains “Mood alteration”, “Social benefits”, “Negative outcomes”, “Compulsive use”, “Excessive time online”, “Withdrawal”, and “Social control” (Caplan, 2002). The second factor structure retrieved identified factors labeled “Social benefits,” “Negative outcomes,” “Rumination on internet,” “Excessive time online,” “Social signals,” “Cognitive change,” and “Impact on job or educational performance” (Alavi et al., 2009). The six factor solution identified factors labeled “Overuse,” Craving for Internet,” “Social cognition,” “Impaired functioning,” “mood change,” and “Social aspects of online” (Li et al., 2008). Results of factor analyses were more consistent for the GPIUS-2, four-factor solutions were found in the validation studies (Caplan, 2010; Fioravanti et al., 2013; Gamez-Guadix, Orue, & Calvete, 2013; Gamez-Guadix et al., 2012). These studies confirmed a one or a second-order factor, always including “Preference for online social interactions”, “Mood regulation”, “Negative outcomes”, and “Deficient self-regulation” which is composed of “Compulsive use” and “Cognitive preoccupation”.

The 3-factor solution of the PIUQ has also been generally supported (Demetrovics et al., 2008; Kelley & Gruber, 2010; Koronczai et al., 2011). These factors were consistently labeled “Obsession”, “Neglect” and “Control disorder”. In the study examining a 12-item form (Kern & Acier, 2013), four factors were extracted (i.e., Self-control, Negative outcomes, Withdrawal, and Preoccupation).

3.2. Tests with less than three evaluating studies

3.2.1. Reliability and validity

The Internet Addiction Scale – IAS (Nichols & Nicki, 2004) is composed of 31 items with a 5-point Likert scale, with an 81-point cut-off score, ranging from “never” to “always” (Canan, Ataoglu, Nichols, Yildirim, & Ozturk, 2010). It has only been evaluated in two studies and presented satisfactory psychometric properties. The internal consistency was found to be excellent (Canan et al., 2010; Nichols & Nicki, 2004), as was the test–retest coefficient: $r = .98$, $p < .001$ (Canan et al., 2010). Convergent validity was established with depressive symptoms ($r = .49$, $p < .001$) (Canan et al., 2010).

The Goldberg’ Internet Addiction Disorder – Diagnostic Criteria – IAD-DC (Goldberg, 1995) is composed of 7 items with a dichotomous choice of response and was only validated in a Chinese version (Shek et al., 2008). A participant who meets three criteria or more is classified as suffering from Internet addiction (Shek et al., 2008). Its convergent validity was established with time spent online ($r = .18$, $p < .001$) (Shek et al., 2008).

The Internet Related Experiences Questionnaire – IREQ (Beranuy, Chamarro, Graner, & Carbonell, 2009), based on the Questionnaire of Internet use related problems – PRI (De Gracia Blanco, Vigo Anglada, Fernández Pérez, & Marco Arbonés, 2002) is composed of 20 items, scored on a 4-point Likert scale. No information about its response modalities has been provided. No cut-off score is available. It has been shown to present satisfactory internal consistency.

The Korea Internet addiction scale – K-scale (Kang & Oh, 2001) is based on a 40-item scale used in several Korean studies (Kim, 2008; Kim, Kim, Park, & Lee, 2002; Lee et al., 2013). The 4-point Likert scale is ranged from “never” to “always”. Internal consistency was good or excellent but other psychometric information could be reported (articles unavailable).

The Use, Abuse and Dependence on Internet inventory – UADI (Del Miglio, Gamba, & Cantelmi, 2001) was originally an 80-items test scored on a 5 point Likert scale, ranging from “absolutely false”

to “absolutely true”. It was validated in one recent study (Gnisci, Perugini, Pedone, & Di Conza, 2011). There is no cut-off score available for this scale. It showed good concurrent validity with a modified version of the IADQ (between $r = .19$ and $r = .53$, $p < .001$) and discriminant validity with time spent online ($r = .30$, $p < .001$ for the second factor “Dependence”) (Gnisci et al., 2011).

The Internet Addiction Questionnaire – IAQ (Wang, 2001) has been created with 28 items and a 4-point Likert scale ranging from “hardly ever true” to “almost always true”. Three cut-off scores have been proposed for discriminating between absent, light, or severe Internet addiction (Wang, 2001). It has also been used in a brief Japanese form (Lu et al., 2011). It appeared to have good convergent validity with depression (between $r = .18$ and $r = .25$, $p < .05$) (Lu et al., 2011).

The Internet Dependency Scale – IDS (Gunuc & Kayri, 2010) is composed of 35 items with a 5-point Likert scale. Except for internal consistency, little psychometric information has been reported.

The Excessive Internet Use Risk Scale – SNIU (Kaliszewska-Czeremska, 2007) is composed of 41 Polish items with a 5-point Likert scale, ranging from “totally agree” to “totally disagree”. No cut-off score is available and few studies have evaluated its psychometric properties.

3.2.2. Factor structure

No factor analysis results were identified for the IAD-DC, the K-IAS and the IDS. The factor structures of the other scales have been rarely evaluated, which suggests that the apparent consensus should be treated with caution. Principal Component Analysis of the IAS has revealed a 1-factor solution explaining 43.2% and 46.5% of the variance (Canan et al., 2010; Nichols & Nicki, 2004), described as “negative consequences of excessive Internet use” (Nichols & Nicki, 2004, p. 383). Regarding the IREQ, factor analysis has suggested a 2-factor solution (i.e., Interpersonal conflicts and Intrapersonal conflicts) which explained 39.3% (Beranuy et al., 2009) and 45.3% of the variance (Casas, Ruiz-Olivares, & Ortega-Ruiz, 2013). A 5-factor solution (i.e., Compensatory escape, Dissociation, Real life impact, Experience making, and Addiction) was proposed for the UADI (Del Miglio et al., 2001). A 2-factor solution (i.e., Real life impact and Dependence) with a reduction to 41 items was also retrieved (Gnisci et al., 2011). Factor analysis of the IAQ has revealed a 6-factor solution (Wang, 2001) composed of “Incontrollability”, “Social escaping”, “Social negativity”, “Physical prolongation”, “Virtual identity” and “Virtual intimacy”. A 2-factor solution composed of “Maladjustment” and “Uncontrollability” has also been retrieved (Lu et al., 2011). Finally, a 3-factor solution has been retrieved for the SNIU (Kaliszewska-Czeremska, 2007).

4. Discussion

Many scales have been developed to measure Internet addiction in particular in Asia, Europe, and the United States of America. Our study is the first to provide a comprehensive review of these instruments. An overarching concern regarding the validity of these scales lies in the lack of definition of Internet addiction and multiple grounding theoretical frameworks leading to the scales being derived from different theoretical concepts (Beard, 2005; Lee et al., 2013; Weinstein & Lejoyeux, 2010). For the most part, Internet addiction is considered an impulse control disorder or behavioral addiction (such as pathological gambling) or a substance disorder, and the scales are therefore generally based on DSM-IV criteria (American Psychiatric Association., 1994). Emerging neuroimaging data in Internet addiction has supported the presence of neurobiological mechanisms associated with both behavioral and substance addictions (Yuan, Qin, Liu, & Tian, 2011) and further research is warranted in order to characterize

the nature of Internet addiction. Given this, assessment tools should aim to assess aspects of Internet addiction related to both of these frameworks at the present time. Furthermore, the assessment of Internet addiction should also aim to evaluate the nature of the activities engaged in while online so as to clarify the nature of the addiction.

Concerns regarding the solidity of the theoretical bases of the different measures can be added to those regarding the general lack of rigorous evaluation of psychometric properties (Wartberg et al., 2013). Indeed, more than 26 scales have only one study supporting their psychometric properties. In order to move forward in the field, efforts should be made to curb the development of new scales and to validate existing scales identified as useful in diverse populations so as to move towards the development of a gold standard assessment method (Beard, 2005; Huang, Wang, Qian, Zhong, & Tao, 2007; Jia & Jia, 2009; Wallace & Masiak, 2011). Consequently, it appears crucial for future research to focus on the examination of the properties of existing scale in diverse cultural settings and among different age groups (Byun et al., 2009; Huang et al., 2007; Pezoa-Jares et al., 2012). While the different scales reviewed here were not all validated in the same cultural context, samples mostly included college students and adolescents (Huang et al., 2007; Osada, 2013) and are frequently too small (Guertler et al., 2014a; Huang et al., 2007). Furthermore, there is a lack of studies conducting validations among individuals clinically diagnosed with Internet addiction (Kim et al., 2013).

The Internet Addiction Test (Young, 1998) emerged as the most frequently used scale for Internet Addiction (Bowen & Firestone, 2011; Frangos, Frangos, & Sotiropoulos, 2012; Lee et al., 2013; Pezoa-Jares et al., 2012; Wartberg et al., 2013; Özcan & Gokcearslan, 2013). It also appears to be the most validated assessment (28 studies in 17 different languages). However, even if the IAT is commonly used as a multidimensional tool, and seems well adapted to evaluate the concept of Internet addiction (Huang et al., 2007; Khazaal et al., 2012; Lai et al., 2013), it lacks of “rigorous and systematic psychometric investigations” (Faraci et al., 2013). The IAT has been the object of criticisms (Demetrovics et al., 2008; Ko et al., 2005b). First, as the majority of Internet addiction assessment tools, it was built according to an “atheoretical perspective” (Gamez-Guadix et al., 2012, p. 1582). The results of factor analyses revealed significant differences between studies suggested a potential lack of construct validity of the IAT, in addition to somewhat low reliability, which was highest among Asian and high-school student groups (Frangos et al., 2012). The 2, the 3 and the 4-factor solutions have been more frequently retrieved and suggest a multidimensional conceptualization of Internet addiction (Chang & Man Law, 2008; Gamez-Guadix et al., 2012). In these three models, the factor related to loss of control and time management seems to be consistently retrieved, except by Osada (2013). This stability was also reflected by the robustness of the negatives outcomes factor, frequently including the social environment, which was identified in all 3, 4 and 5-factor models but with less consistency in the 2-factor solution. These findings confirm a relative consistency of these two dimensions (Watters et al., 2013). Moreover the lack of global factorial consistency of the IAT, and of Internet addiction scales in general, has been frequently justified by cultural differences and methodological issues (i.e., sample size and characteristics, and statistical analyses) (Barke et al., 2012; Hawi, 2013; Pawlikowski et al., 2012; Weinstein & Lejoyeux, 2010). Nevertheless, among other limitations, the lack of evaluation of the validity of the cut-off scores limits its usefulness as a potential screening tool (Barke et al., 2012; Guertler et al., 2014b; Kim et al., 2013). Furthermore, some items have been considered as outdated or vague (Hinich, 2011; Wallace, 2014) and should be deleted or reformulated (Chang & Man Law, 2008; Pawlikowski et al., 2012).

The Compulsive Internet Use Scale (Meerkerk et al., 2009), another well validated tool, demonstrated good psychometric properties in terms of reliability (test–retest and internal consistency) and validity with most studies supporting a 1-factor solution (6/7 studies). The low number of items is an argument in favor of the CIUS but validated cut-off scores still need to be explored. The psychometric properties of the Internet Addiction Diagnostic Questionnaire (Young, 1996) also appeared to be satisfactory even if fewer studies have provided empirical support. Its grounding in the DSM-IV criteria for pathological gambling and its dichotomous scoring could make it a useful tool for clinicians. However, this scale was created almost two decades ago and similar to the IAT, it might be helpful to consider updating certain items (for example such as the anticipation of being connected, in a society in which mobile devices are ubiquitous) so as to make it more relevant to the modern online context.

The reliability and validity of the most frequently used scales should be further explored, including the convergent validity of the IADQ, the CIAS, the PIUQ, and the test–retest reliability of the IADQ, the CIUS and the IRPS which has never been explored. Results of factor analyses also suggest a lack of consistency for most of the scales. Of the more recently developed instruments, the Generalized Problematic Internet Use Scale-2 (Caplan, 2010) reveals the most promise. The scale demonstrated good psychometric properties including a consistent 4-factor model. The brief 15-item format makes it a useful tool, at least in the area of research. Nevertheless, the first proposed 8-point scale of the GPIUS-2 is not consistently used, including in validating studies (i.e., 5 and 6-point scales in Barke et al., 2012; Gamez-Guadix et al., 2012; Gamez-Guadix et al., 2013). Similarly to the GPIUS-2, the Problematic Internet Use Questionnaire (Demetrovics et al., 2008) and its short form (12 and 9 items) are easy to administer.

The clinician's choice of an assessment tool is guided by various constraints such as administration and scoring time, as well as presence of clinically-useful cut-off scores. Administration time on presented scales depends mostly on items' number, and scoring time is generally proportional but generally short for the most validated scales (see Section 3.1.). Likert scales or dichotomous answers are used for calculating global scores and when they are available, cut-off scores can help for diagnosis. Nevertheless, a "lie" scale is lacking for the majority of Internet addiction assessments (Beard, 2005), possibly leading to "faking good" or "faking bad", as is a time frame (e.g., symptoms occurring in the past 6 or 12 months) as is generally used for other clinical disorders. For some authors, the development of a clinical interview appears necessary to validate the presence of Internet addiction (Beard, 2005; Pezoa-Jares et al., 2012), ideally a short form interview, screening the most relevant symptoms of Internet addiction. To date, however, few interviews are available for Internet addiction assessment. For research and clinical work, we also recommend choosing a scale according to the cultural context of its creation, its theoretical basis and age of the concerned population. Given the constant evolution of Internet addiction, the choice of the assessment tool has important implication in both clinical and research settings. It should contribute to the establishment of more consistent epidemiologic data. Nevertheless, certain activities conducted online (such as video gaming, gambling or abusing of sexual material) could lead to an excessive or problematic Internet use (Cartierre et al., 2011; Grant, Potenza, Weinstein, & Gorelick, 2010; Lam-Figueroa et al., 2011; Özcan & Buzlu, 2007). It could be useful to take those uses into account due to their probable influence on Internet addiction (Hawi, 2012; Laconi, Chauchard, Girard, Rodgers, & Chabrol, in press).

Nevertheless, our findings also highlight a number of strengths in the field of Internet addiction. Few areas of research have accumulated such a rich and varied body of assessment tools in

such a short time-period, illustrating the vibrancy and creativeness of the field. Many original papers on Internet addiction assessments have been widely cited. While the number of citations not does strictly speak to the scales' use, it does provide an index of the reach of the scale and its conceptual foundations (i.e., Armstrong et al., 2000; Beard & Wolf, 2001; Brenner, 1997; Caplan, 2002; Davis et al., 2002; Greenfield, 1999; Morahan-Martin & Schumacher, 2000; Young, 1998). In addition, unlike the bulk of the literature in area of addiction that is overwhelmingly conducted in English-speaking Western countries (Stenius, Obot, Kerr-Corrêa, Furtado, & Babor, 2008), the literature included in the present review revealed a valuable diversity in terms of cultural context. Furthermore, the rapid expansion of the literature highlights the possibilities afforded by the study of Internet behaviors using the Internet. The comparative ease of access to highly symptomatic individuals in the area of Internet addiction compared to other disorders is a critical factor in the continued development of this line of research, and, hopefully, the dissemination of effective treatment and preventions interventions which are lacking to date (King, Delfabbro, Griffiths, & Gradisar, 2011).

In conclusion, forty-five tools exist for the assessment of Internet addiction but many of them have been sparsely used and are not well-validated. This study highlights the growing interest in Internet addiction and related assessment tools. Consistent with previous findings about a decade ago (Beard, 2005), our findings highlight the lack of consensus in the field in terms of assessment and the pressing need for a well-established and validated tool to unite the field. Further research should be focused on evaluating psychometric properties of existing scales in different cultural settings age groups, and large samples.

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