



Internet addiction in young adults: A meta-analysis and systematic review

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ARTICLE INFO

Keywords:

Internet addiction
Young
Meta-analysis
FOMO

ABSTRACT

Internet addiction, although not recognized by the WHO or the APA, is a serious and problematic pathology. This meta-analysis shows that the incidence of Internet addiction in adults was high in recent years (2017–2020). The effect size returned according to the random effects model is $Z = 24.63$; $SE = 0.205$; $p = .001$. In addition, high heterogeneity is evident in the research addressing this topic ($Q = 1240.719$, $df = 36$, $p < .001$; $I^2 = 97.09\%$). On the other hand, the Eggers test indicated an absence of publication bias. The sample consisted of 30 studies with $k = 37$ samples from Europe, Asia, America and Oceania. The total sample was constituted by 21,378 participants (51.22% male, 48.78% women; Mean age = 23.55 years). The statistical analyses of meta-regression and model comparison show a complex problem at the international level, explained by age and sex, and apparently also by geographical area. The results of the systematic review show the increase of internet addiction in the new generations, with other variables playing a relevant role, such as: Increase of individualism, lower sociability and enculturation. We conclude highlighting the need to address this problem from a public health approach.

1. Introduction

Nowadays it is considered that over 40% of the world population have access to the Internet, and the use of mobile devices in this regard is increasing, especially the use of smartphones (Montag et al., 2018; Wolniewicz et al., 2018). This phenomenon has posed great advances for society due to their usefulness in education, leisure and information transmission, although it has also generated an addiction disorder that has caused great concern, with an estimation of approximately 2% prevalence in the world adult population (Kuss et al., 2014; Kuss and Lopez-Fernandez, 2016; Poli, 2017). This inappropriate behaviour in the use of the Internet can be problematic, excessive, compulsive or dependent (Hadlington, 2017; Shaw & Black, 2008). Therefore, different voices have pointed out that the obsessive use of the Internet is a public health problem and that it should be included as an obsessive-compulsive disorder (Block, 2008; Young, 1998). As all addiction, besides affecting health, Internet addiction also affects behaviour and social relations (Hou et al., 2019; Müller et al., 2020; Turel et al., 2018; Yao et al., 2020), and it worsens when combined with the existence of other mental disorders (Alimoradi et al., 2019; Andrade et al., 2020; Arcelus et al., 2017; Chou et al., 2017; Dempsey et al., 2019; Fumero et al., 2018; Ko et al., 2009; Lu et al., 2017; Park et al., 2017a;

Poli & Agrimi, 2012; Wegmann et al., 2017).

Internet Addiction Disorder (IAD) can be defined as a lack of control in the use of the Internet, in such a way that it impacts the personal life of the user (Poon, 2018). This is manifested in a compulsive use of social networks, online shopping, sex, videogames, etc. (Kayaş et al., 2016; Park et al., 2017b), i.e., a maladaptive use of the net. Despite the fact that it was defined by Young in 1996 (Young, 1998), this problem is difficult to address and has a risk of relapse (Lindenberg et al., 2017). It is characterised by an excessive use, the appearance of withdrawal syndrome, a negative impact on the family environment and an increasing need of having a more advanced software (Block, 2008; Sha et al., 2019). However, there is no consensus on the identification of this new syndrome of problematic behaviour, understood as a qualitative change that leads to a disease state (Van Rooij & Prause, 2014). The most widely cited models that propose specific identification criteria are: the components model of Griffiths (2005); the Internet Addiction Test of Young (IAT) (1998), and the criteria of Tao et al. (2010), which, according to the study of Van Rooij and Prause (2014), do not provide sufficiently solid evidence that supports IAD. On the other hand, studies on this topic continue to argue, especially since the “Internet Gaming Disorder (IGD)” was included in the appendix of the DSM-5, understood as a recurrent use that involves distress and deterioration inherent in a

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<https://doi.org/10.1016/j.chb.2022.107201>

Received 15 September 2021; Received in revised form 10 January 2022; Accepted 16 January 2022

Available online 19 January 2022

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deficit of self-regulation (American Psychiatric Association, 2013). Argyriou et al. (2017) concluded that this disorder is significantly associated with an alteration in the inhibition of the response in its cognitive, emotional and behavioural (central executive) aspects, and that it also affects attention (Fu et al., 2018; Nikolaidou et al., 2019). Other authors highlighted the importance of personal traits, such as stress and resilience, in online gaming (Canale et al., 2019). Despite all this, the prevalence rate of this disorder is lower than the general rate of Internet addiction (Pan et al., 2020).

It has been detected that problematic Internet users present a significantly lower age with respect to normal users (de Vries et al., 2018; Tran et al., 2017). Reverse relationships have also been found between age and Internet addiction, especially in the studies conducted in South Korea (Heo et al., 2014) and Norway (Bakken et al., 2009), which highlight the difference between adolescents and adults (i.e., from 30 years of age). In this sense, the study of Hassan et al. (2020) divided the sample into two groups: the first group (19–24 years) presented a prevalence value of 28.6%, and the second group (25–35 years) presented a prevalence of 23.5%. Moreover, some studies have reported that young adults are the most active Internet users, and it is considered that they spend approximately 3 h per day connected to the Internet, which causes more probabilities of addiction (Bakken et al., 2009; Holdoš, 2017; Morrison & Gore, 2010; Stavropoulos et al., 2019). This phenomenon is also observed in the gaming disorder (Bányai et al., 2019). These risk circumstances increase when combined with a lack of emotional and psychological support (Arslan, 2017; Durkee et al., 2012; Lei et al., 2018a; Leménager et al., 2018; Tsitsika et al., 2014). Currently, the Internet addiction profile is that of a young adult, in his/her post-adolescence, whose prevalence has increased considerably in 20 years (Dalal & Basu, 2016; Griffiths et al., 2016).

Internet addiction is significantly associated with sex (Hassan et al., 2020), where males show greater prevalence (Ceyhan et al., 2019; Dieris-Hirche et al., 2017; Park et al., 2017b; Tran et al., 2017). Different studies report percentages of over 31% in men and over 21% in women (Cypress, 2011; Xin et al., 2018). This situation can be due to a greater desire among men to explore the unknown, who, in turn, are more attracted by characteristic elements of addiction, such as pornography, online games and cybersex (Cypress, 2011; Doornwaard et al., 2016). However, Holdoš (2017) reported results in which there were no significant differences between sexes. This could be due to the variety of measurement instruments, an imbalance in the sample and the growing popularity of social networks, where women are more active (Chiu et al., 2013; Haferkamp et al., 2012; Lei et al., 2018b).

Regarding the prevalence of addiction by country or geographical area, numerous studies report high rates in Asian countries. Referring, in every case, to young adult population, these rates range between 51% in the Philippines and 48% in Japan (Mark et al., 2014). In Europe, and depending on the study and the country (Germany, Italy, Romania, Estonia and Spain), the prevalence of addiction ranges between 2% and 8% (Pontes et al., 2016; Ustinaviciene et al., 2016). In South American countries, there are large differences. For instance, Chile presents over 11% (Berner et al., 2014) and, in Brazil, some studies report 30% (Cruz et al., 2018). Furthermore, it is paradoxical that a developing country like Bangladesh shows a prevalence of 27.1% (Hassan et al., 2020). The differences in cultural factors can vary depending on the diagnosis criteria and also on the measurement instruments used (Blachnio et al., 2017; Hassan et al., 2020). In this sense, parents in Asian countries consider that any behaviour that takes time from educational and family activities is pathological (Griffiths et al., 2016). Therefore, in some cultures, any use of the Internet that does not have an educational purpose appears as problematic (Kuss et al., 2014). Several studies also point out that the areas and countries with higher rates of Internet consumption are those with greater pollution and dissatisfaction with life (Chern & Huang, 2018). That is, they associate the prevalence rate with the quality of life, obtaining the highest values in countries of the Middle East and the lowest values in Northern and Western Europe

(Cheng & Li, 2014). However, diversity can also be found in the same country, as is the case of China, as a function of the geographical situation (coastal or inland) (Lei et al., 2018a).

In view of the systematic reviews carried out on Internet addiction with different purposes, the aim of the present study was to perform a meta-analysis about Internet addiction in the world adult population, as well as to determine the existence of moderating variables and verifying whether the effect of the geographical situation allowed observing differences in the results.

2. Methods

The research registry protocol was performed following the Cochrane systematic review manual in Higgins and Green (2011) and PRISMA Statement website (2015). The following inclusion criteria were established attending to the specifications established by Botella and Sánchez (2015) and Moreau and Gamble (2020):

- A. Sample age: young adults (18–40 years) attending to the evolutionary criteria expressed in the review by Izquierdo-Martínez (2007).
- B. Research methodology: experimental and quantitative.
- C. Publication date: 2017–2020.
- D. Methodological rigor: studies with recognized prestige, published in journals with Q1 index (Scimago Journal & Country Rank).
- E. Measuring instruments: psychometric tests rated in academic publications.
- F. Language: English.

The exclusion criteria that were established, following the indications of Botella and Sánchez (2015) and Moreau and Gamble (2020), were:

- A. Adult population with previous disorders or pathologies other than Internet addiction or Gaming Disorder as the main feature. However, those investigations in which there were control groups without pathologies other than Internet Addiction or Gaming Disorder were accepted.
- B. The appearance of imprecise data, lack of basic information in data processing and baremization of the measuring instrument, as well as errors in the measurement of the disorders, following the indications of Hunter and Schmidt (2004) and Friese and Frankenbach (2020).

The search strategy followed the parameters established by Botella and Gambara (2002), Botella and Sánchez (2015) and PRISMA Statement website (2015). This was performed in three databases: Psycinfo, Scopus and Science Direct. The search was carried out in April 2020. The following Boolean action was selected: “Internet addiction OR addictive level AND internet OR social network OR video-games” (see Fig. 1). The following filters were set:

- Publication date: 2017–2020.
- Scopus: “article title, abstract, keywords” and research type “article”.
- Psycinfo: “adult”, “keywords”, “peer reviewed journal”, “human”, “English”, “test and measurement”.
- Science Direct: “title, abstract or key words”, “research articles”, “open accesses”.

The Cochrane Handbook of Systematic Reviews, in Higgins and Green (2011), and PRISMA Statement website (2015) establish the eligibility criteria for the selection of studies that make up the sample. In the first instance, it was necessary to code them manually by systematically reviewing each of them according to the inclusion and exclusion criteria. First, they were selected by reviewing them by title and abstract. In this process, a significant number were eliminated. The criteria of methodological rigor and measurement instruments led to the exclusion of most of the studies. The main error detected was either the

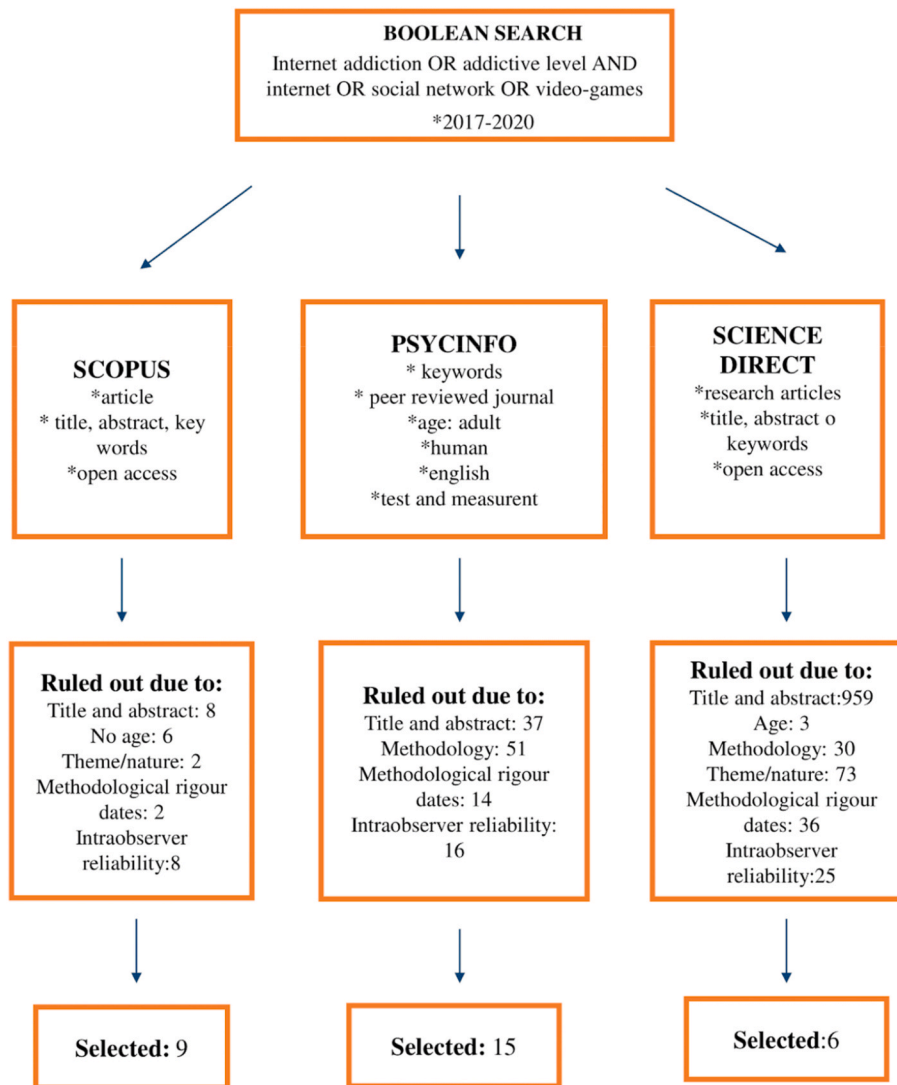


Fig. 1. Flow chart.

absence of standardized instruments or the incorrect measurement of the study parameters according to the pre-established psychometric test. For the comparison and execution of the relevant analyses (comparison of models and meta-regression), the data obtained were transformed to Fisher Z (Cohen, 1988; Martin-Andrés & Luna del Castillo, 2004) using CMA statistical software. This program was also used to study heterogeneity, obtain forest plot and funnel plots, and perform the Eggers test for publication bias.

3. Results

3.1. Demographic description

In recent years (2017–2020) there has been an explosion of research on Internet addiction in young adults. In total, the meta-analysis consists of 30 studies with $k = 37$ samples from Europe, Asia, America and Oceania. The total sample of participants is 21,378, with 51.22% being male, 48.78% female (three studies do not provide data on the sex of their participants). Regarding the size of the samples, the heterogeneity of sizes should be highlighted, the smallest being 22 participants and the largest 3851 participants. On the other hand, the sample size $k = 37$, is large enough to prevent the upper confidence limit from experiencing distortion (Bonett & Price, 2014). Regarding culture, social anthropology points out the need to attend to cultural diversity (Molano, 2007). In

this study, 21.11% are Asian (China and Korea), 70.50% are European (Germany, UK, Spain, Turkey, Ukraine, Poland, Italy, Austria, Switzerland, Hungary), 7.58% are American (USA) and 0.81% from Oceania (New Zealand and Australia). The mean age of the participants was 23.55 years, although some studies did not provide a specific mean age, but a range of years, the arithmetic mean being taken.

3.2. Statistical analysis

The objective of this meta-analysis is to study the prevalence of Internet addiction in the young adult population. In its execution it was necessary to transform all the measures of each study to Fisher's Z-values (Martin-Andrés & Luna del Castillo, 2004). Fig. 2 (forest plot) visualizes the effect size with a 99% confidence interval (4.65–5.46, $p = .001$) for the different studies, with the addition size being $Z = 24.63$; $SE = 0.205$; $p = .001$. In other words, the level of addiction is moderate, without being pathological, but undoubtedly excessively high for a normotypical population. The conversions are presented in their entirety according to the “open materials” criteria of Moreau & Gamble (2020). The measures composing the sample are extracted from different psychometric tests: AICA, BFAS, CIAS, IAT, ICD, IGDS9-SF, IGDT-10, ISS, OCS, Online gaming, SAS-SV, S-IAT, SIAT_SNS, S-IAT-ICD, SUD, SUF and YIAT-C. In sum, the addiction score of the participants (mean age = 23.55) is moderate with a high significance.

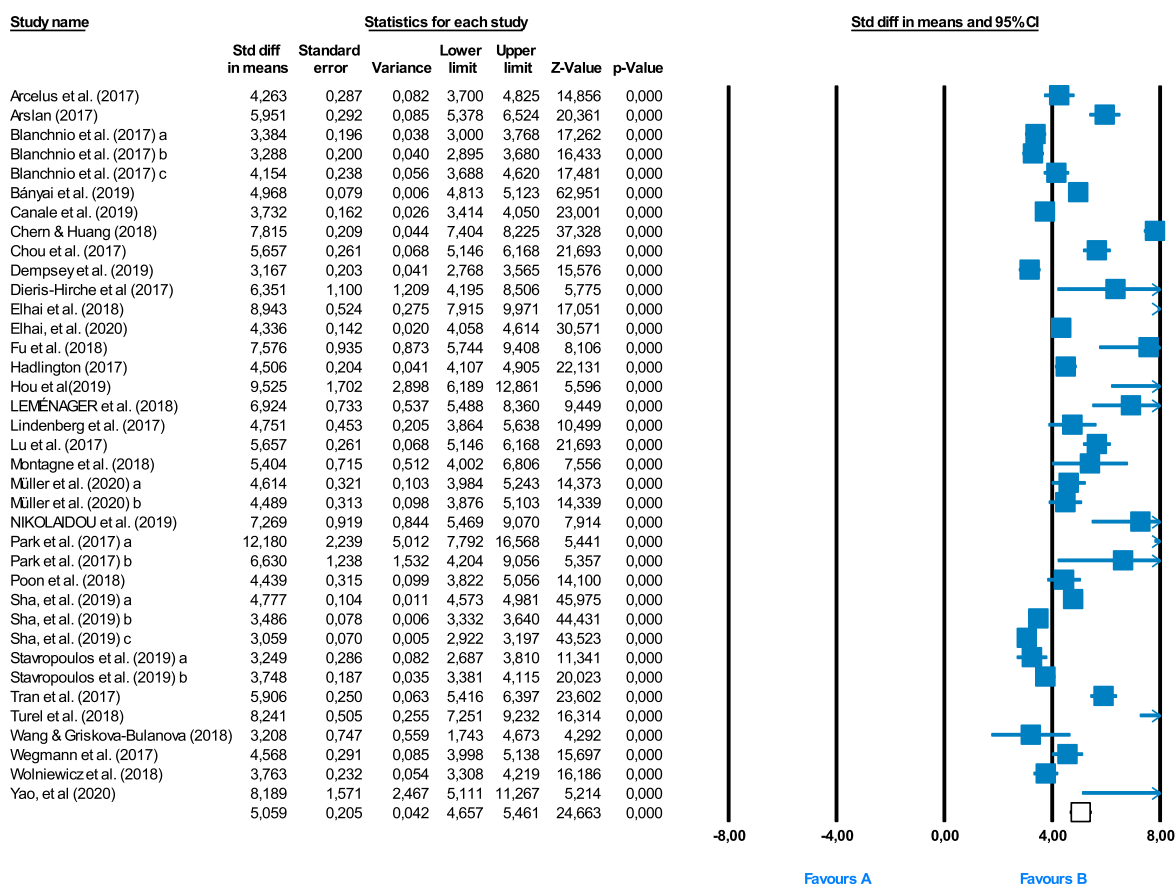


Fig. 2. Forest plot.

The study reporting the highest rate is that of **Bányai et al. (2019)** ($Z = 62.95$, Mean age = 23.08, Hungary) and the one reporting a lower rate is that of **Wang & Griskova-Bulanova (2018)** ($Z = 4.29$, Mean age = 34.41 New Zealand).

Second, the heterogeneity of the sample according to Cochrane in **Higgins and Green (2011)** should be studied (see **Table 2**) (see **Table 1**). The Q statistic of **DerSimonian and Laird (2015)** ($Q = 1240.719$, $df = 36$, $p < .001$) returned high variability, rejecting the homogeneity hypothesis. The statistic $I^2 = 97.09\%$, which explains the percentage of variability resulting from heterogeneity and not from chance, presents very high heterogeneity (**Higgins et al., 2003**). In coherence, it is necessary to follow the Random model or random effects model (**Bonett & Price, 2015; Martín-Andrés & Luna del Castillo, 2004**). Despite the inclusion of criteria that ensure the quality and reliability of the data, it is considered necessary to perform the Egger's test with 99% reliability, to study the effect of bias (**Botella & Sánchez, 2015; Botella & Gambará, 2002**). Said test evidences the inexistence of publication bias with a 99% confidence interval (p -value 1 tailed = 0.0027; p -value 2 tailed = 0.0055) (**Eggers, 1997**) (see **Table 3**). On the other hand, the value of the standard error is not high ($SE = 1.38$), indicating proximity to the regression line and reaffirming the absence of publication bias (**Martín-Andrés & Luna del Castillo, 2004**).

The variability evidenced in the Q and I^2 statistics (see **Table 2**) could indicate the existence of extreme data. However, the tight confidence interval (2.94–3.03) should limit such heterogeneity. These data are consistent with the Funnel Plot graph (**Fig. 3**) where the variability previously found is reaffirmed. This situation reiterates the diversity of studies (**Sterne et al., 2011**), as concluded by the Egger test (**Table 3**). It should be noted that the transformation to Fisher Z-values is not without risk, despite being accepted in the meta-analysis methodology (**Martín-Andrés & Luna del Castillo, 2004**). The $x > 0.5$ values may be

distorted, moving away from the mean values, compared to the normal curve.

3.3. Moderating variables and meta-regression analysis

Previous literature shows the existence of moderating factors. That is why it is considered necessary to establish the study of six moderating variables: male gender, female gender, country, age, culture and measurement instrument. The realization of a meta-regression (**Jak & Cheung, 2019**) and a comparison of models could venture the reason for such high variability of results (**Botella & Sánchez, 2015**). Thus, the meta-regression (see **Table 4**) generated seven models: 1. single, 2. male sex, 3. female sex, 4. country, 5. age, 6. geographic area, and 7. measuring instrument. The first model, in which no moderating variable is introduced, does not help to understand the variance in any percentage, as is the case in the second (male sex), fourth (country) and seventh (instrument). However, model 3 (female sex) accounts for 2% ($R^2 = 0.02$), model 5 (age) explains 14% ($R^2 = 0.14$) and model 6 (geographical area) determines 16% ($R^2 = 0.16$), with a significance of $p < .001$. Although the meta-regression allows a more detailed study of the role of the geographical area (see **Table 5**) and of the measuring instrument (see **Table 6**), it is observed that the studies with samples from Oceania (Australia and New Zealand) show a significant difference, presenting a lower degree of affectation by Internet addiction than their Asian and European counterparts. On the other hand, if meta-regression is performed according to the measurement instruments, it is found that SUF, developed by **Elhai et al. (2016)** and used in **Elhai et al. (2018)** with American sample, and Internet Addiction Test for Chinese (YIAT-C), by **Young (1998)** with Chinese sample, present significant differences at 99% with the rest of the instruments.

Table 1
Sociodemographic data.

Authors	Sample	Age	Addiction	Instrument	Culture	Country	Distribution of participants
Arcelus et al. (2017)	245	27.41	Games	IGDS9- SF	Europe	UK	Transgender sample, with GCMI test,
Arslan, (2017)	438	22.01	Internet	IAT	Europe	Turkey	The sample is representative of the population and they signed ethical consent.
Bányai et al. (2019)	4284	23.08	Games	IGDT-10	Europe	Hungary	The online survey was done for three weeks between November and December 2016 on Facebook profile: GameStar, website of a popular Hungarian video game-related magazine. The sample technique was snowball.
Blachnio et al. (2017) sample a	350	20.78	SNS	BFAS	Europe	Poland	
Blachnio et al. (2017) sample b	320	21.94	SNS	BFAS	Europe	Turkey	The sample technique was snowball.
Blachnio et al. (2017) sample c	341	21.7	SNS	BFAS	Europe	Ukraine	The sample technique was snowball.
Canale et al. (2019)	605	24.01	Games	IGDS9-SF	Europe	Italy	The sample was recruited in research-related websites and Facebook groups.
Chern & Huang, (2018)	1439	20.51	Internet	CIAS	Asia	China	Taiwan
Chou et al. (2017)	500	22.1	Internet	CIAS	Asia	China	The study was approved by the Institutional Review Board of Kaohsiung Medical University Hospital
Dempsey et al. (2019)	291	20.03	SNS	BFAS	America	USA	The sample was constituted by psychology students from a Midwestern U.S. university.
Dieris-Hirche et al. (2017)	35	32.4	Internet	ISS	Europe	Germany	The control group is recruited in the University of Hannover (Department of Medicine and Department of Journalism and Communication Research).
Elhai et al. (2018)	298	19.45	SNS	SUF	America	USA	The sample is representative with ethnical minority: Caucasian (78.6%), self-identified African American (12%), Hispanic/Latino (4.7%), and Asian American (4.3%).
Elhai et al. (2020)	1034	19.34	Internet	SAS-SV	Asia	China	Most of the sample are Han ethnicity (90.8%).
Fu et al. (2018)	68	24.5	Internet	IAT	Asia	China	The research was approved by China University of Technology.
Hadlington, (2017)	538	18–48	Internet	OCS	Europe	UK	The participants were in employed work (either Part-Time or Full-Time) and based in the UK
Hou et al. (2019)	32	20.39	Internet	YIAT-C	Asia	China	The sample was recruited by putting up a poster at campus and advertising on the Internet.
Leménager et al. (2018)	93	28	Internet	AICA	Europe	Germany	The sample was recruited either through the day clinic of the Department of Addictive Behaviour and Addiction Medicine at the Central Institute of Mental Health in Mannheim.
Lindenberg et al. (2017)	120	19.21	Internet	AICA	Europe	Germany	The sample was under treatment at the IDCT health care center in Heidelberg,
Lu et al. (2017)	500	22.1	Internet	CIAS	Asia	China	The sample was recruited using an advertisement posted on websites targeting college students aged from 20 to 30 years.
Montag et al. (2018)	61	Nd	Internet	ICD	Asia	China	No data
Müller et al. (2020) wale 1 ^a	226	22	Internet	sIAT_SNS	Europe	Germany	The sample was convenient and they were recruited by mailing lists of the University of Duisburg-Essen.
Müller et al. (2020) wale 2 ^a	226	22	Internet	sIAT_SNS	Europe	Germany	The sample was convenient and recruited by mailing lists and contact lists of the University of Duisburg-Essen.
Nikolaidou et al. (2019)	65	20.01	Internet	AEQ	Europe	U.K.	The sample was recruited by the University of Bath.
Park et al. (2017a)	30	23.26	Games	IGDT-10	Asia	Korea	No data
Park et al., (2017b)	30	23.26	Games	IGDT-10	Asia	Korea	No data
Poon, (2018)	219	20.98	Internet	IAT	Asia	China	All participants were ethnically Chinese.
Sha et al. (2019) wale a ^a	2299	30.33	SNS	SUD	Europe	Austria, Germany Switzerland	The sample was recruited via the self-test platform SurveyCoder.
Sha et al. (2019) wale b ^a	2299	30.33	SNS	SUD	Europe	Austria, Germany Switzerland	The sample was recruited via the self-test platform SurveyCoder.
Sha et al. (2019) wale c ^a	2299	30.33	SNS	SUD	Europe	Austria, Germany Switzerland	The sample was recruited via the self-test platform SurveyCoder.
Stavropoulos et al. (2019) sample a	153	23.38	Games	IGDT-10	Oceania	Australia	The participants are adult players of Massively Multiplayer Online (MMO).
Stavropoulos et al. (2019) sample b	458	25.25	Games	IGDT-10	America	USA	The participants are adult players of Massively Multiplayer Online (MMO).
Tran et al. (2017)	589	22	Internet	s-IAT	Asia	Taiwan	No data
Turel et al. (2018)	274	25.24	SNS	BFAS	America	USA	No data
Wang & Griskova-Bulanova, (2018)	22	23.81	Internet	IAT	Oceania	New Zealand	The research was approved by the Ethics Committee of the University of Technology of New Zealand.
Wegmann et al. (2017)	270	23.43	Internet	s-IAT-ICD	Europe	Germany and Spain	The survey was done by Facebook and local advertisements.
Wolniewicz et al. (2018)	299	20	Internet	SAS-SV	America	USA	All participants attended a Midwestern U.S. university.
Yao et al. (2020)	28	30	Internet	IGDT-10	Asia	China	The sample was diagnosed with IGD by 5 DSM-5 IGD criteria

^a These are longitudinal studies with measurements taken at different times; the letters a, b, c ... indicate a different wave. Note: The studies Park et al. (2017a) and Park et al., (2017b) coincide in first author and date of authorship but are different investigations.

Table 2
Heterogeneity statistics.

Model		Fixed	Random
Effect size and 95% interval	Point estimate	4.17	5.09
	Standard error	.03	.20
	variance	.001	.04
	Lower limit	4.10	4.65
	Upper limit	4.23	5.41
Test of null (2-Tailed)	Z-value	134.38	24.66
	P-value	.001	.001
	Q-value	1240.71	
Heterogeneity	Df(Q)	36	
	P-value	.00	
	I-squared	97.09	
	Tau squared	1.24	
Tau-squared	Standard Error	.59	
	Variance	.34	
	Tau	1.13	

Table 3
Egger and Begg regression test.

Intercept	4.09
Standard error	1.38
95% lower limit (2-tailed)	1.28
95% upper limit (2-tailed)	6.89
T-value	2.95
DF	35
P-value (1 tailed)	.0027
P-value (2 tailed)	.0055
Confident Interval	99%

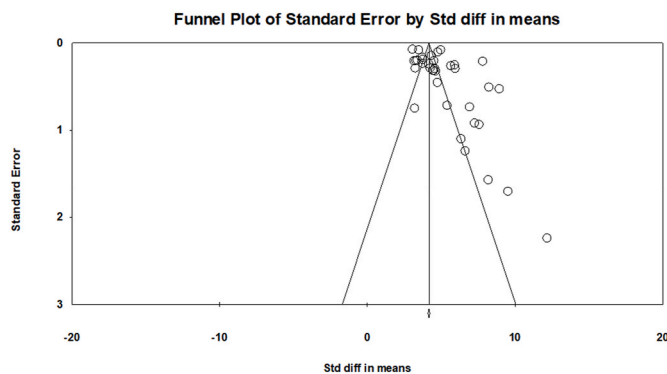


Fig. 3. Funnel plot.

Table 4
Model comparison.

Model name	TauS q	R ²	Q	df	P-Value
Model 1	1.16	.00	1220.35	31	.00
Model 2 MALE	1.16	.00	1220.35	31	.00
Model 3 FEMALE	1.16	.02	1220.35	31	.00
Model 4 COUNTRY	1.16	.00	1220.35	31	.00
Model 5 AGE	1.16	.14	1220.35	25	.00
Model 6 Geographic area	1.16	.16	1220.35	25	.00
Model 7 INSTRUMENT	1.16	.00	1220.35	25	.00

Table 5
Meta-regression according to model 6. Geographical area.

Covariate	Coefficient	Standard Error	95% Lower	95% Upper	Z-value	2-sided p-value	Q	df	P
Intercept	5.36	.49	4.39	6.32	10.87	.00	18.49	3	.0003
Asian papers	.81	.61	-.38	2.01	1.33	.18			
European papers	-.82	.55	-1.92	.26	-1.48	.13			
Oceanian papers	-2.12	.96	-4.01	-.23	-2.21	.02			

4. Discussion

The results of the systematic literature review show that Internet addiction is not only moderated by a series of variables such as sex, age, measurement instrument and geographical area, as well as by the FOMO (fear of missing out), and a high comorbidity with other psychological disorders.

The addictive use of the Internet is associated with interpersonal problems, depression, anxiety (Arcelus et al., 2017; Chou et al., 2017; Dieris-Hirche et al., 2017; Leménager et al., 2018), perceived stress, difficulties in resilience (Canale et al., 2019), and traits such as psychological inflexibility, experiential avoidance and emotional instability (Chou et al., 2017). Similarly, it is also related to personality traits such as ostracism, search for solitude (Poon, 2018), difficulties in awareness, extraversion (Blachnio et al., 2017), borderline personality symptoms (Lu et al., 2017), very low self-concept and emotional intelligence level (Leménager et al., 2018), extreme social retreat or Hikikomori (Stavropoulos et al., 2019), inhibition in behaviours considered risky in the Internet (Hadlington, 2017) and low quality of life in physical, psychological, social and environmental aspects (Chern & Huang, 2018; Tran et al., 2017). Moreover, the severity of Internet addiction is associated not only with a higher rate of mental health problems, but also with a greater severity of their symptoms (Chou et al., 2017; Lu et al., 2017).

Likewise, the intensity of the problematic use of the Internet is associated, to a greater extent, with FOMO and intrusive thoughts (Dempsey et al., 2019), which, in turn, mediate the usual social anxiety of people with IAD. On the other hand, neuroscientific studies show that Internet addiction is related to difficulties in the orienting network, but not to the normotypic functioning of the alert and conflict networks (Fu et al., 2018). Similarly, the participants with IAD of the study of Hou et al. (2019) obtained lower scores in the attention tests and responded to images of loneliness to a greater extent than those participants that showed happiness. In the same line, Nikolaidou et al. (2019) highlighted that attentional bias is a common mechanism associated with the problematic use of the Internet. Montag et al. (2018) showed that the tendency toward the addiction to social networks is associated with a lower volume of grey matter in the subgenual anterior cingulate cortex, which is an essential area for regulatory control in addiction behaviours. Likewise, people with a greater probability of developing Internet addiction are more likely to present a functional reduction in the frontal lobe region (Wang & Griskova-Bulanova, 2018). Lastly, it is important to mention that Yao et al. (2020) recommend interpreting the results with caution, since there is no clear neurological comparison between behavioural and chemical addictions.

Moreover, psychological abuse is a predictive factor of Internet addiction (Arslan, 2017). Another aspect found in the systematic literature review is that depressed and/or anxious university students, with difficulties to attend to their academic tasks, experience greater boredom, using social networks to palliate it (Elhai et al., 2018). In this way, the propensity to boredom is a predictive factor of the problematic use of the Internet, and it also mediates the severity of the anxious-depressive symptoms (Elhai et al., 2018). In this sense, it is necessary to specify that people with IAD have a distorted notion of the time they spend in social networks, arguing that they engage in more social or academic activities than they actually do (Turel et al., 2018).

Another important aspect is procrastination, which mediates and

Table 6
Meta-regression according to model 7. Instrument.

Covariate	Coefficient	Standard Error	95% Lower	95% Upper	Z-value	2-sided p-value	Q	df	P
Intercept	4.48	1.17	2.18	6.79	3.81	.00	31.67	17	.01
AICA	2.43	1.79	-1.07	5.94	1.36	.17			
BFAS	-.58	1.31	-3.15	1.98	-.45	.65			
CIAS	1.05	1.32	-1.54	3.65	.79	.42			
IAT	1.07	1.30	-1.48	3.63	.82	.40			
ICD	1.16	1.65	-2.07	4.41	.70	.48			
IGDS9-SF	-.75	1.64	-3.97	2.46	-.46	.64			
IGDT-10	.59	1.27	-1.91	3.09	.46	.64			
ISS	1.86	1.97	-2.00	5.72	.94	.34			
OCS	.01	1.64	-3.21	3.24	.01	.99			
Online gaming	-.05	1.66	-3.31	3.21	-.03	.97			
SAS-SV	.61	1.43	-2.18	3.42	.43	.66			
S-IAT	-1.42	1.63	-4.63	1.77	-.87	.38			
SIAT_SNS	1.81	1.61	-1.34	4.98	1.13	.26			
S-IAT-ICD	-.74	1.64	-3.96	2.48	-.45	.65			
SUD	-.32	1.43	-3.14	2.48	-.23	.81			
SUF	4.45	1.71	1.08	7.82	2.59	.00			
YIAT-C	5.03	2.36	.40	9.66	2.13	.03			

maximises the problematic use of social networks, thus FOMO strengthens the users' fear of missing or not finding a more suitable alternative within social life (Müller et al., 2020; Wolniewicz et al., 2018). In this sense, Nikolaidou et al. (2019) highlight that the urgent need of remaining online is positively related to the amount of hours spent online in the case of suffering Internet addiction. Furthermore, it is also necessary to mention that FOMO controls all types of addiction to Smartphone, WhatsApp and Facebook, although it is the quality of life which determines FOMO (Sha et al., 2019). In this study, it is worth highlighting that FOMO involves a specific cognition that acts as a mediator between the central characteristics of a person and Internet addiction (Wegmann et al., 2017).

It is also necessary to highlight that users who play sport games spend more hours, although they obtain better results in motivation and skills development than traditional gamers (Bányai et al., 2019). This is attributed to the fact that online gaming is considered an escape route from everyday difficulties.

Regarding geographical areas, the literature shows that Internet addiction decreases significantly in Australia and New Zealand, clearly differentiating themselves from Asian cultures, where there is a positive relationship. These results are in line with previous studies in Asian countries, where the prevalence rates range between 40% and 50% (Mark et al., 2014), whereas in European countries the range is 2–8% (Pontes et al., 2016; Ustinaviciene et al., 2016). Furthermore, each culture and society generates a series of rules, producing their own axiological scales. According to Bronfenbrenner (1979), a macrosystem appears, in which cultural diversity emerges. This diversity can influence the measurement instruments, thus there are significant differences in the diagnosis of Internet addiction (Blachnio et al., 2017; Hassan et al., 2020), even within the same country, as was demonstrated by the meta-analysis of Lei et al. (2018a, 2018b) with a Chinese population. We found that SUF, with an American population, and the Internet Addiction Test for Chinese people (YIAT-C), by Young (1998), with a Chinese population, showed significant differences at 99% with the rest of the psychometric tests. However, other instruments with samples of both nations did not show such discrepancy, which urges the generation of common diagnostic criteria that allow developing similar and comparable measurement instruments.

With respect to women, as an important moderating variable of this study, it is worth highlighting a greater affectation in females regarding smartphone addiction (Wolniewicz et al., 2018) and WhatsApp use disorder (Sha et al., 2019). Specifically, Elhai et al. (2018) indicate that women have been associated with problematic smartphone usage (PSU), which would be in line with previous studies, such as Jeong, Kim, Yum, & Hwang (2016) and Wang, Wang, Gaskin, & Wang (2015). This seems to indicate that sex may determine the social use of mobile phones. In

this line, Dempsey et al. (2019) also found that the female gender was an indicator of severity in problematic Facebook use (PFU), which is in agreement with other studies indicating that being young and female were significant predictive factors of PFU (Andreassen, 2015). Likewise, other studies highlight that, with respect to women, men with Internet addiction have a better health-related quality of life (HRQOL) in the physical dimension, but not in the social dimension (Chern & Huang, 2018), which could be attributed to biological differences in terms of sex, lifestyles and the different patterns of social interaction. However, although the results of this study are in the previously explained direction, other studies such as that of Wegmann et al. (2017) have not found differences between sexes, although other authors have found that women show a certain tendency toward being affected by this problem (Choi et al., 2015; De Cock, Simone, Davison, & Slutsker, 2013). Other studies even show results in the opposite direction, with gender being associated with some other variable. For instance, Dieris-Hirche et al. (2017) found that being male was a particularly important predictive factor of Internet addiction in a group of depressive patients. This can be more congruent with the current literature on this topic, where, as a general rule, Internet addiction is associated with the male gender (Ceyhan et al., 2019; Cypress, 2011; Park et al., 2017b; Xin et al., 2018). In any case, the results seem to be diverse and even some authors, such as Holdoš (2017), did not find significant differences between sexes.

The scientific literature does show consensus on the consideration of age as a moderating variable, since many studies have detected a significantly lower age in users with Internet addiction with respect to users who make a normal use of the net (de Vries et al., 2018; Tran et al., 2017). In this sense, young adults have emerged as the most active Internet users, which involves a greater probability of developing addictive behaviours (Bakken et al., 2009; Holdoš, 2017; Morrison & Gore, 2010; Stavropoulos et al., 2019). The results of the present review show studies in which young age is an important predictive factor of Internet addiction (Dieris-Hirche et al., 2017; Wolniewicz et al., 2018) and problematic Facebook use (PFU) (Dempsey et al., 2019). Moreover, when associating age with another type of variables, it has been observed that young people with Internet addiction also show deficits in orientation (Fu et al., 2018). Similarly, other authors have also reported a greater level of perceived stress associated with Internet Gaming Disorder (IGD) in young adults (Canale et al., 2019), relating this behaviour not only to a younger age, but also to interpersonal problems and depression (Arcelus et al., 2017). However, other studies focused on specific aspects of Internet addiction, such as PSU, have detected no correlation with age (Elhai et al., 2018), despite the existence of other works that have demonstrated greater levels of PSU among younger people (Lu et al., 2011; Van Deursen & Van Dijk, 2015).

5. Conclusion

As a consequence of the digitalisation that took place in current society, a moderate-high addiction to social networks has emerged in the young adult population, which, without being pathological, is excessive for a normotypical population. However, this addictive behaviour is mainly moderated by age and sex, and apparently also by geographical area. All this indicates that addiction in the young adult population may increase with the incorporation of the new generations (or digital natives), with implications such as an increase of individualism, lower sociability, enculturation, etc.; therefore, it is necessary to conduct a thorough evaluation of society, assessing the possible consequences of the increasing digitalisation.

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